# SURFACE WATER AMBIENT MONITORING PROGRAM (SWAMP)

# REPORT ON CARLSBAD HYDROLOGIC UNIT (HU) SAMPLING BETWEEN MARCH AND SEPTEMBER 2002

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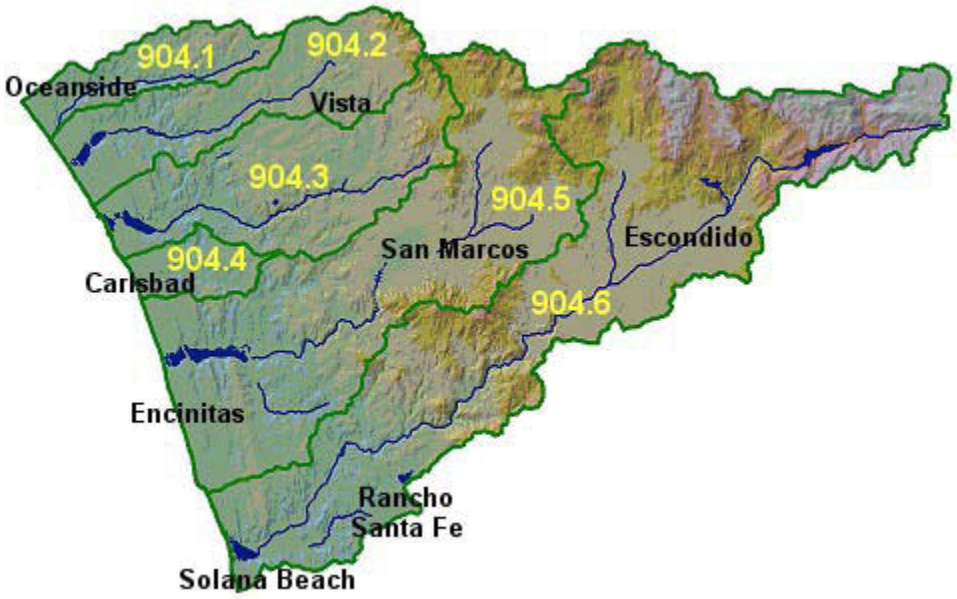


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# 1. INTRODUCTION

## 1.1. PURPOSE OF REPORT

This report presents the results of the monitoring conducted in the Carlsbad Hydrologic Unit between March and September 2002 under the Surface Water Ambient Monitoring Program (SWAMP). The monitoring was intended to provide reliable, high quality information necessary to produce water quality assessment [305(b)] and impaired waters [303(d)] lists that are more comprehensive and more defensible than those of past years.

The primary objective for this SWAMP report is to identify specific locations of degraded water or sediments in rivers, lakes, near shore waters, enclosed bays, or estuaries using several critical threshold values of toxicity, water column or epibenthic community analysis, habitat condition, and chemical concentration.



## 1.2. ORGANIZATION OF REPORT

As background, this report begins by discussing the general characteristics of the Carlsbad Hydrologic Unit, identifying major water bodies and their hydrologic characteristics and beneficial uses. This background section includes brief discussions of the section 303(d) water quality impairments, land use and political boundaries, other monitoring programs that either are underway or recently have been completed and contains other noteworthy information about the watersheds in the Hydrologic Unit.

The body of the report discusses the SWAMP methodology applied during the study, and provides the monitoring results, an analysis of the data and conclusions related to the SWAMP objectives. The report then briefly correlates the SWAMP data with the data from the municipal storm water NPDES monitoring and other programs to determine if there are opportunities to maximize sampling with changes in required programs.

The report concludes by discussing suggestions for improving the SWAMP program, as well as for overall monitoring in the Carlsbad Hydrologic Unit. These suggestions include possible actions to maximize the benefit of SDRWQCB monitoring resources, the application of existing monitoring data for multiple purposes and suggestions for further monitoring in the Hydrologic Unit using future SWAMP resources.

## 2. BACKGROUND

### 2.1. DESCRIPTION OF WATERSHED[1]

The Carlsbad Hydrologic Unit (CHU) is approximately 211 square miles and is formed by a group of six individual watersheds in northern San Diego County. The CHU is bordered by the San Luis Rey River Watershed to the north and by the San Dieguito River Watershed to the south. It reaches inland nearly 24 miles to just northeast of Lake Wohlford. The maximum elevation of the CHU is approximately 2,400 feet and it extends to sea level at the Pacific Ocean. The CHU is comprised of six Hydrologic Areas: Loma Alta, Buena Vista Creek, Agua Hedionda, Encinas, San Marcos Creek, and Escondido Creek.

The CHU contains four major coastal lagoons: Buena Vista, Agua Hedionda, Batiquitos, and San Elijo as shown on Figure 1. The CHU includes the entire Cities of Carlsbad, San Marcos and Encinitas and portions of the cities of Oceanside, Vista, Escondido, Solana Beach, and San Diego County unincorporated areas. The jurisdictional breakdown (by land area) for each of the six Hydrologic Areas (watersheds) is indicated in Table 2-1 and shown in Figure 2.1.



Table 2-1

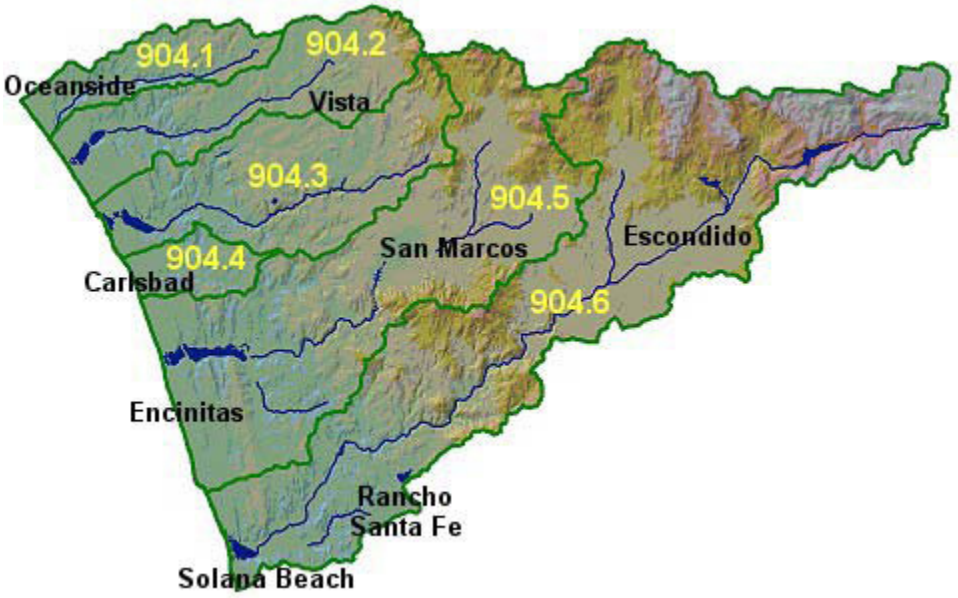
| WATERSHED | RECEIVING WATERBODY | SIZE (sq.mi.) | PECENT % | Jurisdictional Breakdown (%) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | CARLSBAD | ENCINITAS | ESCONDIDO | OCEANSIDE | SAN DIEGO CO. | SAN MARCOS | SOLANA BEACH | VISTA |
| **Carlsbad Hydrologic Unit (904)** | | **211.5** | 100 | 18 | 9 | 13 | 8 | 32 | 11 | 1 | 8 |
| Loma Alta (904.10) | Loma Alta Slough | **9.8** | 5 | | | | 97 | | | | 3 |
| Buena Vista Creek (904.20) | Buena Vista Lagoon | **22.6** | 11 | 19 | | | 26 | 11 | | | 45 |
| Agua Hedionda (904.30) | Agua Hedionda Lagoon | **29.4** | 14 | 41 | | | 6 | 24 | 5 | | 24 |
| Encinitas (904.40) | Pacific Ocean | **5.4** | 3 | 100 | | | | | | | |
| San Marcos (905.50) | Batisquitos Lagoon | **59.7** | 28 | 29 | 15 | 5 | | 19 | 33 | | |
| Escondido Creek (904.60) | San Elijo Lagoon | **84.6** | 40 | | 11 | 29 | | 55 | 4 | 1 | |

Figure 2.1

[1] The source of the material in Section 2.1 is from the report *Watershed Urban Runoff Management Program Carlsbad Hydrologic Unit* dated January 2003 and prepared by the Cities of Encinitas, Escondido, Oceanside, San Marcos, Solana Beach and Vista and the County of San Diego

Regional Location of the Carlsbad Hydrologic Unit (Source: San Diego County Project Clean Water)

Figure 2.2
Carlsbad Hydrologic Unit (Source: Carlsbad Watershed Urban Runoff Management Program)




### 2.1.1. LAND USE

Land uses within the watersheds are diverse, including urban and suburban development, industrial, commercial, intense agriculture, floriculture, confined animal operations, open space, and recreational. Approximately 48% of the CHU is urbanized. The dominant land uses are residential (29%), freeways and roads (12%), agricultural (12%), commercial/industrial (6%), and vacant/ underdeveloped (32%). The population of the CHU is approximately 500,000 residents making it the third most densely populated in San Diego County behind San Dieguito and Los Penasquitos HUs. A high percentage of the underdeveloped land is private ownership and the population of the CHU is projected to increase to over 700,000 residents by 2015. The area is also responsible for the agricultural production of various agricultural crops including avocados, citrus and dairy, but horticultural production is the primary agricultural use.

### 2.1.2. GEOLOGIC AND GEOMORPHIC SETTING

The CHU is typical of the regional geologic and geomorphic setting of the San Diego coastal region. The drainage basins are, for the most part, relatively small features situated on low-lying coastal terraces and bounded on the east by foothill features of the coastal mountain ranges. The CHU is composed of a number of small drainage basins that are punctuated by larger drainage basins (San Luis Rey and San Dieguito) that wrap

around them and extend well inland to the mountain regions.

### 2.1.3. SOILS

The soils within the CHU range from excessively drained gravelly sands to well drained clays, and include areas of rough broken land, terrace escarpments, and steep gullied land. However, many of the CHU soil series have characteristics that can have a significant effect on water quality related issues. There are many properties and qualities that affect soil erodibility. Factors include slope, surface layer texture, restricted permeability, and the grade of structure in the surface layer. Since severely erodible soils comprise 90% of the CHU, caution must be used when developing land use plans and implementing grading ordinances. Probable development areas, built on highly erodible soil, pose a potential threat to the water quality and sediment management of the hydrologic unit.

Other important soil characteristics include infiltration rate (the rate at which soil absorbs precipitation), and shrink-swell factor (the amount of water a soil can hold and how quickly water can be released). Both of these characteristics affect how quickly precipitation is transformed into surface runoff and how long subsurface flows will continue into the dry season. Soils that have a slow infiltration rate and a high shrink-swell factor are likely to generate surface runoff sooner, but also continue to discharge subsurface flows longer than a soil with a fast infiltration rate and a low shrink-swell factor.



### 2.1.4. VEGETATION COMMUNITIES

Historically, the CHU was comprised of narrow corridors of riparian forest, woodlands and scrub along the primary drainages, with grasslands along the valley bottoms and gently sloping hills transitioning into coastal sage and chaparral scrubs in the upland areas and groves of oak woodlands within areas of more mesic conditions. Currently, native habitats comprise approximately 39% of the CHU, with non-native constituting the remaining 61%. Native habitats primarily include upland vegetation consisting of Coastal Sage and Chaparral Scrubs, and smaller areas of Oak Woodlands, Native Grasslands, Riparian Forests/Woodlands, Riparian Scrubs, Marsh/Wetlands, and open water areas; non-native habitats include non-native grasslands and disturbed, agricultural and developed areas.

### 2.1.5. CLIMATE

The climate variations within the CHU are primarily the result of the degree of coastal influence and elevation. The average minimum temperatures within the CHU range from approximately 39°F to 47°F in the winter and from 51°F to 63°F during the summer months. The average maximum temperatures within the CHU range from approximately 65°F to 69°F in the winter and from 70°F to 91°F during the summer months. The annual average precipitation ranges from approximately 10 inches within the coastal areas to 17

inches within the more mountainous inland areas. Most of the precipitation falls as rain during the months from December to April. Snow is a very rare occurrence in the upper elevations of the CHU.

### 2.1.6. POPULATION AND SUBURBAN GROWTH

The population of the CHU, as estimated in the Carlsbad Watershed Management Plan, was nearly 500,000 in 2000. San Diego County's growth rate has been increasing dramatically over the past decades. According the San Diego Association of Governments, San Diego County's population is expected to increase by approximately one million within the next twenty years. This growth will require more than 400,000 new housing units. A significant portion of that growth will take place in northern San Diego County. An example of that growth can be seen now in the City of San Marcos, which lies within the CHU. It is currently the fastest-growing city in the county. This trend is further reinforced based on the population trends for the seven cities within the CHU from 1980 through the year 2020.



### 2.1.7. DESCRIPTION OF HYDROLOGIC AREAS

The CHU is comprised of six Hydrologic Areas or watersheds; Loma Alta Creek, Agua Hedionda Creek, Encinas Creek, San Marcos Creek, and Escondido Creek. Below is a brief description of each of these watersheds from north to south.

**Loma Alta Creek**

The Loma Alta Creek watershed is the northernmost watershed of the CHU. It is approximately 6,300 acres in area, comprising 5% of the CHU. The watershed extends inland about 7.3 miles and the highest elevation within the drainage area is 460 feet above mean sea level. The primary receiving waters in the watershed are Loma Alta Creek, which drains into the Loma Alta Slough and the Pacific Ocean. The watershed is located almost entirely inside the City of Oceanside with less than 5% in the City of Vista. Within the CHU, only the Encinas watersheds are smaller in area than the Loma Alta Creek watershed.

**Buena Vista Creek**

The Buena Vista Creek Watershed is the fourth largest system within the CHU. The watershed extends approximately 10.6 miles inland from the coast and totals approximately 14,400 acres in area, comprising 11% of the CHU. Buena Vista Creek originates on the western slopes of the San Marcos Mountains and discharges into the Pacific Ocean via Buena Vista Lagoon. The primary receiving waters in the watershed are Buena Vista Creek, the Buena Vista Lagoon, and the Pacific Ocean. The largest portion of the watershed is in the City of Vista (45%), with the remaining in Oceanside,

Carlsbad, and San Diego County.

**Agua Hedionda Creek**

Agua Hedionda Creekis the third largest watershed within the CHU. The watershed, dominated by Agua Hedionda Creek, extends approximately 10.6 miles inland from the coast and is about 18,800 acres in area, comprising 14% of the CHU. Agua Hedionda Creek originates on the southwestern slopes of the San Marcos Mountains in west central San Diego County and discharges into the Pacific Ocean via Agua Hedionda Lagoon. The primary water bodies in the watershed include Aqua Hedionda Creek, Buena Creek, Letterbox Canyon, Agua Hedionda Lagoon and the Pacific Ocean. Most of the watershed is in the City of Carlsbad (41%); the remainder is in Vista (24%) and San Diego County (24%) and small amounts in Oceanside and San Marcos.

**Encinas Creek**



The Encinas Creek watershed is 3,400 acres in size, making it the second smallest watershed within the CHU. The watershed extends inland from the coast 2.4 miles and the highest elevation within the drainage is approximately 430 feet above mean sea level. The watershed begins as a small drainage behind an industrial area where it is immediately channelized. The Encinas Creek continues down through industrial and office parks associated with Palomar Airport until it reaches the lower valley area. It then makes its way to the Pacific Ocean after crossing Interstate 5 and Pacific Coast Highway. The Encinas watershed is entirely within the city of Carlsbad and the only significant receiving water body is the Pacific Ocean.

**San Marcos Creek**

The San Marcos Creek watershed is the second largest watershed within the CHU. The watershed, dominated by San Marcos Creek, extends approximately 14.1 miles inland from the coast and is about 36,000 acres in area, comprising 28% of the CHU. San Marcos Creek originates on the western slopes of the Merriam Mountains in west central San Diego County and discharges in to the Pacific Ocean via Batiquitos Lagoon. Encinitas Creek is one of the major tributaries in the watershed. It originates in the hills southwest of Questhaven Road and parallels El Camino Real before it confluence with San Marcos Creek at the southeastern corner of Batiquitos Lagoon. The highest elevation within the watershed is approximately 1,540 feet above mean sea level. Lake San Marcos is the largest impoundment within the watershed. There are also a number of small farm ponds on various tributaries in the lower basin. The major receiving water-bodies within the watershed are San Marcos Creek, Encinitas Creek, Batiquitos Lagoon, and the Pacific Ocean. The Cottonwood Creek sub-basin is also located in this watershed which drains a portion of Encinitas directly into the Pacific Ocean. The San Marcos Creek watershed is primarily located in San Marcos, Carlsbad, Encinitas, and the County of San Diego, with a small portion in Escondido.

**Escondido Creek**

The Escondido Creek watershed is the largest and most complex system within the CHU. The watershed extends approximately 24.6 miles inland from the coast and totals 54,100 acres in the area, comprising 40% of the CHU. Escondido Creek watershed originates in Bear Valley in north central San Diego County and discharges into the Pacific Ocean via San Elijo Lagoon. Elevations within the watershed range from sea level to 2,420 feet on the ridges above Bear Valley. There are three main reservoirs within the watershed: Lake Wohlford, Dixon Lake and San Dieguito Reservoir. Another major impoundment, Olivenhain Reservoir is currently under construction. Most of the watershed is in unincorporated areas of the County (55%). The remaining is in the cities of Escondido and Encinitas, with a small portion in San Marcos and Solana Beach. The primary receiving waters are Escondido Creek, Lake Wohlford, Lake Dixon, Reidy Canyon, San Elijo Lagoon, and the Pacific Ocean.



## 2.2. BENEFICIAL USES OF SURFACE WATERS

As presented in Table 2-2, the Water Quality Control Plan for the San Diego Region(9) (Basin Plan) lists the beneficial uses for designated surface waters in the Carlsbad HU. These beneficial uses form the cornerstone for the State's water quality protection programs.

## 2.3. SECTION 303(D) IMPAIRED WATER BODIES

Section 303(d) of the federal Clean Water Act (CWA, 33 USC 1250, et seq., at 1313(d)), requires States to identify waters that do not meet water quality standards after applying certain required technology-based effluent limits ("impaired" water bodies). States are required to compile this information in a list and submit the list to USEPA for review and approval. This list is known as the Section 303(d) list of impaired waters. Impaired water bodies within the Carlsbad HU, as identified through the Clean Water Act Section 303(d) process, are provided in Table 2-3.

Table 2-2 Beneficial Uses of Surface Waters in Carlsbad HU

| **Surface Waters**[1, 2] | Hydrologic Unit Basin Number | MUN | AGR | IND | PROC | GWR | FRSH | POW | REC1 | REC2 | COMM | BIOL | EST | WARM | COLD | WILD | RARE | MAR | AQUA | MIGR | SPWN | SHEL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Carlsbad HU Coastal Waters** | | | | | | | | | | | | | | | | | | | | | | |
| Loma Alta Creek | 4.10 | + | | | | | | | ○ | ● | | | | ● | | ● | | | | | | |
| *Loma Alta Slough* | 4.10 | | | | | | | | ● | ● | | | | ● | | ● | ● | ● | | | | |
| *Buena Vista Lagoon* | 4.21 | | | | | | | | ● | ● | | ● | ○ | ● | | ● | ● | ● | | | | |
| Buena Vista Creek | 4.22 | + | ● | | | | | | ● | ● | | | | ● | | ● | | | | | | |
| Buena Vista Creek | 4.21 | + | ● | ● | | | | | ● | ● | | | | ● | | ● | ● | | | | | |
| *Agua Hedionda Lagoon* | 4.31 | | | ● | | | | | ● | ● | ● | | ● | | | ● | ● | ● | ● | ● | | ● |
| Agua Hedionda Creek | 4.32 | ● | ● | ● | | | | | ● | ● | | | | ● | | ● | | | | | | |
| Buena Creek | 4.32 | ● | ● | ● | | | | | ● | ● | | | | ● | | ● | | | | | | |
| Agua Hedionda Creek | 4.30 | ● | ● | ● | | | | | ● | ● | | | | ● | | ● | | | | | | |
| Letterbox canyon | 4.31 | ● | ● | ● | | | | | ● | ● | | | | ● | | ● | | | | | | |
| Canyon de las Encinas | 4.40 | + | | | | | | | ○ | ● | | | | ● | | ● | | | | | | |
| **San Marcos Creek Watershed** | | | | | | | | | | | | | | | | | | | | | | |
| *Batiquitos Lagoon* | 4.51 | | | | | | | | ● | ● | | ● | ● | | | ● | ● | ● | | ● | | |
| San Marcos Creek | 4.52 | + | ● | | | | | | ● | ● | | | | ● | | ● | | | | | | |
| unnamed intermittent streams | 4.53 | + | ● | | | | | | ● | ● | | | | ● | | ● | | | | | | |
| San Marcos Creek | 4.51 | + | ● | | | | | | ● | ● | | | | ● | | ● | | | | | | |
| Encinitas Creek | 4.51 | + | ● | | | | | | ● | ● | | | | ● | | ● | | | | | | |
| **Escondido Creek Watershed** | | | | | | | | | | | | | | | | | | | | | | |
| *San Elijo Lagoon* | 4.61 | | | | | | | | ● | ● | | ● | ● | | | ● | ● | ● | | ● | | |
| Escondido Creek | 4.63 | ● | ● | ○ | | | | ● | ● | ● | | | | ● | ● | ● | | | | | | |
| *Lake Wohlford* | 4.63 | ● | ● | ○ | | | | ● | ●[3] | ● | | | | ● | ● | ● | | | | | | |
| *Lake Dixon* | 4.62 | ● | ● | ○ | | | | | ●[3] | ● | | | | ● | ● | ● | | | | | | |
| Escondido Creek | 4.62 | ● | ● | ○ | | | | | ● | ● | | | | ● | ● | ● | | | | | | |
| Reidy Canyon | 4.62 | ● | ● | ○ | | | | | ● | ● | | | | ● | ● | ● | | | | | | |
| Escondido Creek | 4.61 | ● | ● | ○ | | | | | ● | ● | | | | ● | ● | ● | | | | | | |



● Existing Beneficial Use
○ Potential Beneficial Use
+ Excepted from MUN (See Text)

[1] Waterbodies are listed multiple times if they cross hydrologic area or sub area boundaries.
[2] Beneficial use designations apply to all tributaries to the indicated waterbody, if not listed separately.
[3] Fishing from shore or oat permitted, but other water contact recreation (REC-1) uses are prohibite

Table 2-3 2002 List of Section 303(d) Impaired Waterbodies

| Hydrologic Descriptor | Waterbody | Segment / Area | Pollutant / Stressor | Extent of Impairment |
|---|---|---|---|---|
| Loma Alta HA (904.10) | Pacific Ocean Shoreline | at Loma Alta Creek Mouth | Bacterial Indicators | 1.1 miles |
| Loma Alta HA (904.10) | Loma Alta Slough | | Bacterial Indicators Eutrophic | 8.2 acres |
| Buena Vista Creek HA (904.20) | Pacific Ocean Shoreline | at Buena Vista Creek, Carlsbad City Beach at Carlsbad Village Drive, Carlsbad State Beach at Pine Avenue | Bacterial Indicators | 1.2 miles |
| El Salto HSA (904.21) | Buena Vista Lagoon | | Bacterial Indicators Sedimentation / Siltation | 202 acres |
| Los Monos HSA (904.31) | Agua Hedionda Lagoon | | Bacterial Indicators Sedimentation / Siltation | 6.8 acres |
| Los Monos HSA (904.31) | Agua Hedionda Creek | lower portion | Total Dissolved Solids | 7 miles |
| San Marcos HA (904.50) | Pacific Ocean Shoreline | at Moonlight State Beach | Bacterial Indicators | 0.5 miles |
| Escondido Creek HA (904.60) | Pacific Ocean Shoreline | at San Elijo Lagoon | Bacterial Indicators | 0.44 miles |
| San Elijo HSA (904.61) | San Elijo Lagoon | | Bacterial Indicators Eutrophic Sedimentation / Siltation | 566 acres |



## 2.4. MONITORING WITHIN THE CARLSBAD HU

The Municipal Storm Water permit for the County of San Diego (County), incorporated cities within the County, San Diego Unified Port District, and San Diego Airport Authority requires the copermittees to conduct receiving water monitoring. Various versions of the monitoring program have been in effect since 1993. The program has evolved through time to include more sample sites and programs. Monitoring requirements include chemical and toxicity testing of runoff from long-term mass loading stations, rapid stream bioassessments, ambient bay and lagoon monitoring, and dry weather and coastal outfall sampling. A chronology of the evolution of the monitoring program, as well as specific methodologies and results for the Carlsbad HU, can be found in the *San Diego County Municipal Copermittees 2003-2004 Urban Runoff Monitoring Final Report* (MEC; January 2005).

A summary of the 2003-2004 monitoring results is provided in Section 4.0. Where appropriate, and when additional SWAMP resources are available, quantitative water quality data from copermittee monitoring will be integrated with the SWAMP data to allow for a more comprehensive assessment of water quality within the Carlsbad HU.

## 3. SURFACE WATER AMBIENT WATER MONITORING PROGRAM

At the time samples were collected in the Carlsbad HU, SWAMP monitoring in the San Diego region was intended to provide reliable, high quality information necessary to produce water quality assessment [305(b)] and impaired waters [303(d)] lists that are more comprehensive and more defensible than those of past years. The primary objectives for SWAMP monitoring in the San Diego region were those identified as numbers 9, 10, and 11 in the "Site Specific Monitoring" section of the SWRCB Report to the Legislature (See Table 3-1).



Table 3-1 Primary Objectives for SWAMP Monitoring

| Number | Primary Objectives for SWAMP Monitoring |
|---|---|
| 9 | At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded water or sediments in rivers, lakes, nearshore waters, enclosed bays, or estuaries using several critical threshold values of toxicity, water column or epibenthic community analysis, habitat condition, and chemical concentration. |
| 10 | At sites influenced by point sources (e.g., storm drains, publicly owned treatment works, etc.) or nonpoint sources of pollutants, identify specific locations of degraded sediment in rivers, lakes, nearshore waters, enclosed bays, or estuaries using several critical threshold values of toxicity, water column or epibenthic community analysis, habitat condition, and chemical concentration. |
| 11 | Identify the areal extent of degraded sediment locations in rivers, lakes, nearshore waters, enclosed bays, and estuaries using several critical threshold values of toxicity, benthic community analysis, habitat condition, and chemical concentration. |

These objectives are related to the question of whether aquatic populations, communities, and habitats are protected.

Over time, the goals and objectives of the SWAMP program within the San Diego region have evolved. Originally and primarily, the San Diego region intended to use SWAMP data in of support of Clean Water Act sections 303(d) and 305(b) assessments. While available resources and the still incomplete Listing Policy preclude SWAMP data alone being sufficient for these purposes, some knowledge of ambient conditions is still obtained. SWAMP data should be used to initiate or support site-specific actions. These include traditional enforcement and the issuance of requests for more information under the authority of Porter Cologne.

Secondarily, SWAMP should serve as the framework to establish comprehensive regional ambient monitoring. Through the increased internal organization and the development of partnerships with stakeholders, SWAMP can coordinate available regional resources to truly characterize ambient conditions throughout the region. The data will then allow the identification of trends in water quality and beneficial uses, support development of regional nutrient criteria and further support the refinement of the Index of Biotic Integrity (IBI). Public and stakeholder education and fostering increased stewardship of our waters are additional goals and objectives.

### 3.1. SAMPLE COLLECTION METHODOLOGY

Samples were collected and analyzed in accordance with the Fiscal Year 2000-2001 Work Plan. Sample locations are shown on Figure 3-1. Cruise reports that describe sampling activities are provided in Appendix A; sampling stations and dates are listed in Table 3-2 and monitoring analysis in Table 3-3



Table 3-2 SWAMP Carlsbad HU Sampling Locations and Dates

| Station No. | Location | Hydo. Area | Latitude | Longitude | Sample Dates | | | |
|---|---|---|---|---|---|---|---|---|
| 904CBAQH6 | Agua Hedionda Creek | 904.31 | 33.14887 | -117.29758 | 3/12/2002 | 4/23/2002 | 6/4/2002 | 9/18/2002 |
| 904CBBUR1 | Buena Creek | 904.32 | 33.17225 | -117.20887 | 3/12/2002 | 4/23/2002 | 6/3/2002 | 9/17/2002 |
| 904CBBVR4 | Buena Vista Creek | 904.21 | 33.18147 | -117.32893 | 3/12/2002 | 4/22/2002 | 6/3/2002 | 9/16/2002 |
| 904CBCWC2 | Cottonwood Creek | 904.51 | 33.04852 | -117.29513 | 3/13/2002 | 4/23/2002 | 6/4/2002 | 9/17/2002 |
| 904CBENC2 | Encinitas Creek | 904.51 | 33.06828 | -117.26261 | 3/13/2002 | 4/23/2002 | 6/4/2002 | 9/17/2002 |
| 904CBESC5 | Escondido Creek | 904.62 | 33.08559 | -117.15037 | 3/13/2002 | 4/24/2002 | 6/4/2002 | 9/18/2002 |
| 904CBESC8 | Escondido Creek | 904.61 | 33.03393 | -117.23565 | 3/13/2002 | 4/24/2002 | 6/4/2002 | 9/17/2002 |
| 904CBLAC3 | Loma Alta Creek | 904.10 | 33.19993 | -117.33008 | 3/12/2002 | 4/22/2002 | 6/3/2002 | 9/16/2002 |
| 904CBSAM3 | San Marcos Creek | 904.52 | 33.13027 | -117.19200 | 3/12/2002 | 4/23/2002 | 6/4/2002 | 9/17/2002 |
| 904CBSAM6 | San Marcos Creek | 904.51 | 33.08791 | -117.26852 | 3/13/2002 | 4/23/2002 | 6/4/2002 | 9/17/2002 |

Table 3-3 SWAMP Carlsbad HU Sampling Analytes

| **Field Measurements** | **Inorganics (water samples)** | **Metals dissolved (water sample)** | **OP Pesticides (water sample)** | **OC Pesticides (water sample)** | **PCBs (water sample)** |
|---|---|---|---|---|---|
| stream velocity | Alkalinity as $CaCO_3$ | Aluminum | Aspon | Aldrin | PCB 005 |
| dissolved oxygen | Ammonia as N | Arsenic | Azinphos ethyl | Chlordane, cis | PCB 008 |
| pH | Nitrate & Nitrite as N | Cadmium | Azinphos methyl | Chlordane, trans | PCB 015 |
| temperature | Nitrogen as Total Kjeldahl | Chromium | Bolstar | Chlordene, alpha | PCB 018 |
| conductivity | OrthoPhosphate as P | Copper | Carbophenothion | Chlordene, gamma | PCB 027 |
| turbidity | Total Phosphorus as P | Lead | Chlorfenvinphos | Dacthal | PCB 028 |
| | Sulfate | Manganese | Chlorpyrifos | DDD(o,p') | PCB 029 |
| | | Nickel | Chlorpyrifos methyl | DDD(p,p') | PCB 031 |
| | **PAHs (water sample)** | Selenium | Ciodrin(Crotoxyphos) | DDE(o,p') | PCB 033 |
| | | Silver | Coumaphos | DDE(p,p') | PCB 044 |
| **Trianzine Herbicides (water sample)** | Acenaphthene | Zinc | Demeton-s | DDMU(p,p') | PCB 049 |
| | Acenaphthylene | | Diazinon | DDT(o,p') | PCB 052 |
| | Anthracene | | Dichlofenthion | DDT(p,p') | PCB 056 |
| Ametryn | Benz(a)anthracene | | Dichlorvos | DDT(p,p') | PCB 060 |
| Atraton | Benzo(a)pyrene | | Dicrotophos | Dieldrin | PCB 066 |
| Atrazine | Benzo(b)fluoranthene | | Dimethoate | Endosulfan I | PCB 070 |
| Prometon | Benzo(e)pyrene | | Dioxathion | Endosulfan II | PCB 074 |
| Prometryn | Benzo(g,h,i)perylene | **Fish Tissue** | Disulfoton | Endosulfan sulfate | PCB 087 |
| Propazine | Benzo(k)fluoranthene | at station | Ethion | Endrin | PCB 095 |
| Secbumeton | Biphenyl | 904CBSAM5 | Ethoprop | Endrin Aldehyde | PCB 097 |
| Simazine | Chrysene | 5 red ear sunfish | Famphur | Endrin Ketone | PCB 099 |
| Simetryn | Dibenz(a,h)anthracene | 15 crayfish | Fenchlorphos | HCH, alpha | PCB 101 |
| Terbuthylazine | Dimethylnaphthalene, 2,6- | | Fenitrothion | HCH, beta | PCB 105 |
| Terbutryn | Fluoranthene | at station | Fensulfothion | HCH, delta | PCB 110 |
| | Fluorene | 904CBAQH6 | Fenthion | HCH, gamma | PCB 114 |
| | Indeno(1,2,3-c,d)pyrene | 5 black bullhead | Fonofos (Dyfonate) | Heptachlor | PCB 118 |
| | Methylnaphthalene, 1- | | Leptophos | Heptachlor epoxide | PCB 128 |
| | Methylnaphthalene, 2- | | Malathion | Methoxychlor | PCB 137 |
| | Naphthalene | | Merphos | Mirex | PCB 138 |
| | Perylene | | Methidathion | Nonachlor, cis | PCB 141 |
| | Phenanthrene | | Mevinphos | Nonachlor, trans | PCB 149 |
| | Phenanthrene/Anthracene, C1 - | | Molinate | Oxadiazon | PCB 151 |
| | Pyrene | | Naled(Dibrom) | Oxychlordane | PCB 153 |
| | Trimethylnaphthalene, 2,3,5- | | Parathion, Ethyl | Tedion | PCB 156 |
| | | | Parathion, Methyl | | PCB 157 |
| | **Toxicity (water sample)** | | Phorate | | PCB 158 |
| | Ceriodaphnia dubia | | Phosmet | | PCB 170 |
| | Selenastrum capricornutum | | Phosphamidon | | PCB 174 |
| | | | Sulfotep | | PCB 177 |
| | | | Terbufos | | PCB 180 |
| | **Toxicity (sediment sample)** | | Tetrachlorvinphos | | PCB 183 |
| | Hyalella azteca | | Thiobencarb | | PCB 187 |
| | | | Thionazin | | PCB 189 |
| | | | Tokuthion | | PCB 194 |
| | | | Trichlorfon | | PCB 195 |
| | | | Trichloronate | | PCB 200 |
| | | | Triphenyl phosphate (Surrogate) | | PCB 201 |
| | | | | | PCB 203 |
| | | | | | PCB 206 |

### 3.2. THRESHOLD VALUES

Threshold values are used to determine constituent concentrations or toxicity values which are elevated or biologic assessment data or fish tissue data, which indicate an impairment. Exceedance of a threshold value does not necessarily equate to exceedance of a regulatory value; rather the values are used for comparison purposes. Threshold values have been determined from a variety of sources including:

- *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan);
- Code of Federal Regulations Title 40 part 131 Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California (CTR);
- Maximum Contaminant Levels (MCL) established in the California Code of Regulations
- Total Maximum Daily Load (TMDL;)
- US Environmental Protection Agency (USEPA) National aquatic life criteria;
- Method Detection Limit (MDL) or Reporting Limit (RL); and Statistical Methodologies.



#### 3.2.1. CHEMICAL DATA

The Threshold Value for OP Pesticides, OC Pesticides, Trianzine Herbicides, PAHs, and PCBs is the method detection limit (MDL) or in cases where the result was below the MDL, the reporting limit if proper quality assurance/ quality control procedures was documented by the laboratory. Otherwise, the Threshold Values listed were based upon the *Water Quality Control Plan for the San Diego Basin (9)* (Basin Plan), which contains numerical and narrative water quality objects for all inland surface waters and coastal lagoons within the Carlsbad HU. The Basin Plan incorporates by reference the maximum contaminant levels specified in California Code of Regulations, Title 22, Table 64444-A of section 6444 (Organic Chemicals{ XE "Water quality objective:Organic chemicals – primary standards" }), Table 64431-A of section 64431 (Inorganic Chemicals), Table 64449-A (Secondary Maximum Contaminant Levels, Consumer Acceptance Limits) for all surface water in the watershed that are designated for use as domestic or municipal supply (MUN). The Basin Plan also incorporates by reference for all inland surface waters and coastal estuaries, the numerical objectives for toxic pollutants applicable to California as specified in 40 CFR 131.36 (§131.36 revised at 57 FR 60848, December 22, 1992). Criteria from USEPA's National Recommended Water Quality Criteria to protect Freshwater Aquatic Life were used as threshold values for alkalinity, ammonia, and selenium in the absence of other applicable criteria. The CTR contains criteria for selenium, but it is not applicable in San Diego region. The chronic CTR selenium limit is the same as the chronic USEPA criteria.

Numerical water quality objectives are presented in the Basin Plan for some constituents by hydrologic area and subarea in Table 3-2. In addition, the Basin Plan specifies the following:

- *The discharge of wastes shall not cause concentrations of un-ionized ammonia (NH3) to exceed 0.025 mg/l (as N) in inland surface waters, enclosed bays and estuaries and coastal lagoons.*

- *Inland surface waters, bays and estuaries and coastal lagoon waters shall not contain biostimulatory substances{* XE "Water quality objective:*Biostimulatory substances*" *} in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses.*

  *Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those which stimulate algae and emergent plant growth. Threshold total phosphorus (P) concentrations shall not exceed 0.05 mg/l in any stream at the point where it enters any standing body of water, nor 0.025 mg/l in any standing body of water. A desired goal in order to prevent plant nuisance in streams and other flowing waters appears to be 0.1 mg/l total P. These values are not to be exceeded more than 10% of the time unless studies of the specific water body in question clearly show that water quality objective changes are permissible and changes are approved by the Regional Board. Analogous threshold values have not been set for nitrogen compounds; however, natural ratios of nitrogen to phosphorus are to be determined by surveillance and monitoring and upheld. If data are lacking, a ratio of N:P = 10:1 , on a weight to weight basis shall be used.*



- *Dissolved oxygen levels shall not be less than 5.0 mg/l in inland surface waters with designated MAR or WARM beneficial uses or less than 6.0 mg/l in waters with designated COLD beneficial uses. The annual mean dissolved oxygen concentration shall not be less than 7 mg/l more than 10% of the time.*

- *In inland surface waters the pH shall not be depressed below 6.5 nor raised above 8.5.*

- *All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, bioassays of appropriate duration, or other appropriate methods as specified by the Regional Board.*

### 3.2.2. TOXICITY DATA

The evaluation threshold used to determine whether the associated level for identifying if an environmental sample is significantly different from its associated control sample, was 80 percent. The statistical test method was the paired T-test. The Toxicity Significant Effect Code indicates whether the sample result is significantly different from the control. The results are reported in a significant effects code. The code is in two parts. The first

part of the code refers to the probability value, calculated using the statistical method, which is significant if below .05. The second part of the code refers to the percentage difference between the sample mean and the 80% evaluation threshold. Table 3-4 lists the Toxic Significant Effect Codes.

Table 3-4 Toxic Significant Effect

| Code | Description |
|---|---|
| F_LC50 | Fails LC50 (50% mortality), draft |
| S | Statistically significant, see comments. |
| X | None - Sample is control or reference and statistical significance is not applicable. |
| NSR | Not significant when compared to reference, sample not compared to negative control. |
| NSL | Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met) |
| SG | Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met) |
| NSG | Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met) |
| SR | Significant when compared to reference, sample not compared to negative control. |
| NR | Not reported. |
| NS | Not significant, see comments for any available explanation. |
| SL | Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met) |
| NA | Significance not applicable to sample. |



### 3.2.3. Fish Tissue (To be developed)

## 3.3 DATA ANALYSIS METHODOLOGY

Results from the three types of monitoring were assessed to evaluate the extent and causes of pollution in receiving waters and to prioritize management actions to eliminate or reduce the sources. The framework provided in Table 3-5 below was used to determine conclusions from the data and appropriate follow-up actions. The framework in Table 3-5 was derived from the *Model Monitoring Program for Municipal Separate Storm Sewer Systems in Southern California* (SMC, 2004).

When, based on the framework in Table 3-5, data indicates the presence of toxic pollutants, conducting a Toxicity Identification Evaluation (TIE) is recommended. A TIE is a set of procedures used to identify the specific chemical(s) responsible for toxicity to aquatic organisms. When discharges are toxic to a test organism, a TIE must be conducted to confirm potential

constituents of concern and rule out others, therefore allowing the prioritization of appropriate management actions. If a sample is toxic to more than one species, it is necessary to determine the toxicant(s) affecting each species. If the type and source of pollutants can be identified based on the data alone and an analysis of potential sources in the drainage area, a TIE is not necessary.

When a TIE identifies a pollutant as a cause of toxicity, it will then necessary to conduct a toxicity reduction evaluation (TRE). A TRE is a study conducted in a step-wise process to identify the causative agents of toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. A TRE should include an analysis and discussion of all potential source(s) causing toxicity, proposed BMPs to eliminate or reduce the pollutants causing toxicity, and suggested follow-up monitoring to demonstrate that toxicity has been removed.

Table 3-5 Triad Approach to Determining Follow-Up Actions

| | **Chemistry** | **Toxicity** | **Bioassessment** | **Possible Conclusion Determining Action** | **Action** |
|---|---|---|---|---|---|
| 1. | Persistent[2] exceedance of water quality objectives | Evidence of toxicity[3] | Indications of benthic alteration[4] | Strong evidence of pollution-induced degradation | Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |
| 2. | No persistent exceedances of water quality objectives | No evidence of toxicity | No indications of benthic alteration | No evidence of pollutant-induced degradation | No action necessary |
| 3. | Persistent exceedance of water quality objectives | No evidence of toxicity | No indications of benthic alteration | Contaminants are present but not bioavailable | Assess possible upstream sources of pollutants causing exceedances |
| 4. | No persistent exceedances of water quality objectives | Evidence of toxicity | No indications of benthic alteration | Unmeasured contaminants exist with the potential to cause degradation to aquatic life | Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |
| 5. | No persistent exceedances of | No evidence of toxicity | Indications of benthic alteration | Alteration probably not due | No action necessary due to toxic |

[2] Persistent exceedance shall mean the exceedance of relevant Basin Plan or CTR objectives by 20% for three sampling events.
[3] Evidence of toxicity shall mean a Toxic Significant Effect determination of SL (significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Both criteria met)) on two or more dates.
[4] Indications of benthic alteration shall mean an IBI score of Fair, Poor, or Very Poor.

| | Chemistry | Toxicity | Bioassessment | Possible Conclusion Determining Action | Action |
|---|---|---|---|---|---|
| | water quality objectives | | | to toxic pollutants | chemicals<br>Initiate TRE for physical sources of benthic alteration |
| 6. | Persistent exceedance of water quality objective | Evidence of toxicity | No indications of benthic alteration | Toxic contaminants are bioavailable, but in situ effects are not demonstrable | If chemical and toxicity tests indicate persistent degradation, conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |



## 3.4 SWAMP Results and Data Analysis

### 3.4.1 General Findings

a. PCBs were not detected in any of the samples collected.

b. PAHs were very rarely detected in the samples. Naphthalene was found in five of the forty samples and phenanthrene in three samples.

c. The most frequent OP pesticides detected were diazinon (87.5% of the samples) and disulfoton (65%). The next frequent OP pesticide was dimethoate, which was detected in 15% of the samples.

d. Oxadiazon was the most frequently detected OC pesticide (70% of the samples). DDE (p,p') was the second most frequently OC pesticide at 35%. Dacthal and HCH, alpha were detected in 17.5% of the samples.

e. Atrazine (20% of the samples), prometon (15%), propazine (20%), secbumeton (47.5%) and terbuthylazine (50%) were the triazine herbicides detected in the samples.

f. Except for selenium, concentrations of dissolved metals in all the samples were well below threshold values. As noted in Section 3.2.1 above, the threshold value for selenium was based upon the criteria from USEPA's National Recommended Water Quality Criteria to protect Freshwater Aquatic Life. Approximately 70% of the samples exceeded this threshold of 5 ug/L.

g. Total nitrogen and total phosphorus exceeded the Basin Plan objective in approximately 65% of the samples and the objective for sulfate in 80% of the samples.

### 3.4.2 Agua Hedionda Creek

**Station No. 904CBAQH6** is located in HA 904.31, south of Cannon Rd, west of El Camino Real intersection in the City of Carlsbad. Samples were collected on the upstream side of the bridge in the main stem of stream. (GPS 33.14887N 117.29758W). The average turbidity measured at this station was the lowest of all stations in the Carlsbad HU.

Water Chemistry (Table 3-6.1)

Threshold values for total nitrogen, and sulfate were persistently exceeded. Total nitrogen (total kjeldahl nitrogen + nitrate + nitrite as N) exceeded the Basin Plan objective of 1.0 mg/L in 3 of 4 samples. Sulfate exceeded the Basin Plan objective of all four occasions.



The test results show that this location had the fewest detections (19) of pesticides/ herbicides of all the sampling stations in the Carlsbad HU. Diazinon exceeded the MDL in one sample and was detected but not quantifiable in another. The sample that exceeded the MDL was below the Regional Board numeric targets in the Chollas Creek TMDL (Loading Capacity) that were set equal to the California Department of Fish and Game's water quality criteria for the protection of freshwater aquatic organisms from diazinon. The acute water quality criterion of 0.08 ug/L protects aquatic life from short-term exposure to diazinon, while the chronic criterion of 0.05 ug/L protects aquatic life from long-term diazinon exposure. Other OP Pesticides detected were demeton-s, dimethoate, mevinphos, and naled(dibrom) in single samples. Disulfoton was detected twice at levels below the RL.

OC Pesticides detected in single samples were chlordane (gamma), DDE (p,p'), HCH (alpha), and HCH (delta) Oxadiazon was detected in three samples, twice above the RL and once below.

Terbuthylazine exceeded the MDL in two of the four samples. Other Trianzine Herbicides detected, but in only one sample below the RL, were atrazine and secbumeton.

Toxicity: (Table 3-6.2)

Water samples showed persistence of toxicity to ceriodaphnia and selanastrum. The results for 4 of the 4 water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on ceriodaphnia (young/female) and selenastrum. Sediment was SL for Hyalella in one of the 4 samples.

Table 3-6.1 Monitoring Results: Station CBAHC6 - Agua Hedionda Creek

| STATION 904CBAQH6 | | Threshold Value | Source | SampleDate 03/12/02 | | 4/23/02 | | 6/4/02 | | 9/17/02 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Analyte | Units | | | Value | Notes | Value | Notes | Value | Notes | Value | Notes |
| **General/Physical** | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 7.82 | | 8.15 | | 7.76 | | 7.52 | |
| Specif. Conduct. | mS/cm | | | 2.707 | | 2.828 | | 2.748 | | 3.008 | |
| Temp. | $^0$C | | | 14.44 | | 20.65 | | 15.48 | | 18.78 | |
| Turbidity | ntu | 20 | BP | 0.57 | | 0.95 | | 0.24 | | 1.4 | |
| Velocity | fps | | | 0.917 | | 1.66 | | ND | | 1.34 | |
| Sat.Oxygen | % | | | 95.8 | | 113.6 | | 94.9 | | 98.9 | |
| **Inorganics** | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 234 | | 237 | | 229 | | 229 | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | a | 0.13 | | 0.07 | a | 0.071 | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 1.35 | | 1.36 | | 1.18 | | 0.481 | |
| Nitrogen, Total Kjeldal | mg/L | 1 | BP | 0.37 | a | 0.52 | | 0.37 | a | 0.34 | |
| OrthoPhosphate as P | mg/L | | | 0.047 | | 0.052 | | 0.024 | | 0.026 | |
| Phosphorus, Total as I | mg/L | 0.1 | BP | 0.05 | | 0.05 | | 0.04 | | 0.036 | |
| Sulfate | mg/L | 250 | BP | 32 | | 432 | | 449 | | 522 | |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 1.21 | | 0.998 | | 3.65 | | -0.10 | b |
| Arsenic | µg/L | 50 | MCL | 4.17 | | 4.61 | | 1.88 | | 3.89 | |
| Cadmium | µg/L | 4.1/11 | CTR | 0.0548 | | 0.0447 | | 0.0305 | | 0.0776 | |
| Chromium | µg/L | 50 | MCL | 1.4 | | 0.335 | | 0.145 | | 0.3 | |
| Copper | µg/L | 18/29 | CTR | 2.48 | | 2.89 | | 2.21 | | 2.44 | |
| Lead | µg/L | 6.2/160 | CTR | -0.01 | b | -0.01 | b | -0.002 | b | 0.0039 | |
| Manganese | µg/L | 50 | MCL | 76.8 | | 38.1 | | 126 | | 51 | |
| Nickel | µg/L | 110/950 | CTR | 0.561 | | 1.53 | | 0.664 | | 2.75 | |
| Selenium | µg/L | 20 | CTR | 5.82 | | 6.52 | | 2.14 | | 7.74 | |
| Silver | µg/L | 14 | CTR | -0.01 | b | -0.01 | b | 0.0209 | | -0.01 | b |
| Zinc | µg/L | 240/240 | CTR | 2.04 | | 0.496 | | 1.73 | | 2.7 | |
| **OP Pesticides** | | | | | | | | | | | |
| Demeton-s | µg/L | 0.04/0.1 | MDL/RL | 0.04 | a | -0.04 | b | -0.04 | b | -0.04 | b |
| Diazinon | µg/L | 0.01/0.02 | MDL/RL | 0.032 | | 0.013 | a | -0.005 | b | -0.005 | b |
| Dimethoate | µg/L | 0.03/0.05 | MDL/RL | -0.03 | b | 0.04 | a | -0.03 | b | -0.03 | b |
| Disulfoton | µg/L | 0.01/0.05 | MDL/RL | 0.03 | a | 0.03 | a | -0.01 | b | -0.01 | b |
| Mevinphos | µg/L | 0.03/0.05 | MDL/RL | 0.04 | a | -0.03 | b | -0.03 | b | -0.03 | b |
| Naled(Dibrom) | µg/L | 0.03/0.05 | MDL/RL | 0.04 | a | -0.03 | b | -0.03 | b | -0.03 | b |
| **OC Pesticides** | | | | | | | | | | | |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | 0.003 | | -0.001 | b | -0.001 | b |
| HCH, alpha | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.0015 | |
| HCH, delta | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b |
| Oxadiazon | µg/L | 0.001/0.002 | MDL/RL | 0.001 | a | 0.006 | | 0.005 | | -0.001 | b |
| **Trianzine Herbicides** | | | | | | | | | | | |
| Atrazine | µg/L | 0.02/0.05 | MDL/RL | 0.035 | a | -0.02 | b | -0.02 | b | -0.02 | b |
| Secbumeton | µg/L | 0.02/0.05 | MDL/RL | 0.035 | a | -0.02 | b | -0.02 | b | -0.02 | b |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL/RL | 0.13 | | 0.175 | | -0.02 | b | -0.02 | b |
| **PCBs** | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | |
| Anthracene | µg/L | 0.02 | RL | -0.02 | | 0.035 | | -0.02 | | -0.0125 | |
| Naphthalene | µg/L | 0.02 | RL | -0.02 | | 0.035 | | -0.02 | | -0.0125 | |
| Phenanthrene | µg/L | 0.02 | RL | -0.02 | | 0.035 | | -0.02 | | -0.0125 | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL

Table 3-6.2 Toxicity Results Station CBAQH6 - Agua Hedionda Creek

| Station CBAQH6 | Toxicity Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | | | |
| Sample Type: | grab | | grab | integrated | | | |
| Matrix: | water | | water | sediment | | | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | | | |
| Eval Threshold | 80% | | 80% | 80% | | | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | | | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | | 10 days | |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | | Survival (%) | |
| Unit | % | Num/Rep | cells/ml | mg/ind | | % | |
| Rep Count | 10 | 10 | 4 | 8 | | 8 | |
| **3/12/2002** | | | | | | | |
| Mean | 100 | 17 | 273[illegible]000 | 0.13 | | 80 | |
| Std Dev | 0 | 4 | 59[illegible] | 0.039 | | 16.9 | |
| Probability | 0.172 | 0.012 | 0.001 | 0.032 | | 0.153 | |
| Pct Control | 111.1 | 7[illegible]3 | [illegible].7 | 142 | | 91.4 | |
| Tox Sig Effect Code | NSG | S[illegible] | SL | SG | | NSG | |
| **4/23/2002** | | | | | | | |
| Mean | 100 | 16 | 2648000 | 0.209 | | 23 | |
| Std Dev | 0 | 6 | 358143 | 0.167 | | 13.9 | |
| Probability | 0.5 | 0.032 | 0.001 | 0.355 | | 0 | |
| Pct Control | 100 | 69.5 | 51.7 | 89.9 | | 24 | |
| Tox Sig Effect Code | NSG | SL | SL | NSG | | SL | |
| **6/4/2002** | | | | | | | |
| Mean | 100 | 11 | 2113000 | 0.207 | | 99 | |
| Std Dev | 0 | 4 | 132035 | 0.031 | | 3.54 | |
| Probability | 0.084 | 0.004 | 0 | 0 | | 0.092 | |
| Pct Control | 125 | 53.3 | 43.2 | 143 | | 105 | |
| Tox Sig Effect Code | NSG | SL | SL | SG | | NSG | |
| **9/17/2002** | | | | | | | |
| Mean | 100 | 10 | 2793000 | 0.22 | 0.249 | 73 | 84 |
| Std Dev | 0 | 3 | 608687 | 0.048 | 0.038 | 16.7 | 9.16 |
| Probability | 0.5 | 0.012 | 0 | 0.015 | 0.01 | 0.241 | 0.148 |
| Pct Control | 100 | 64.6 | 42.7 | 79 | 120 | 92.2 | 108 |
| Tox Sig Effect Code | NSG | SL | SL | SL | SG | NSG | NSG |



TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

### 3.4.3 Buena Creek

**Station CBBUR1** is located in HA 904.32 off Santa Fe Ave and Azalea Rd. (GPS 33.17225N 117.20887W) This station had the lowest average concentration of specific conductance at 1.839 measured at all the stations.

Water Chemistry (Table 3-7.1)

Water quality objectives for total nitrogen, total phosphorus and sulfate exceeded Basin Plan objectives in all samples. Concentrations of nitrite/nitrate – nitrogen were the second highest in the watershed, approximately 7 times greater than the station with the third highest levels.

OP Pesticides that were detected included demeton-s, diazinon, dimethoate, disulfoton, mevinphos, and Naled(Dibrom). Diazinon was the most prevalent, exceeding the MDL in one sample and was detected but not quantifiable in two others. The sample that exceeded the MDL was below the Regional Board numeric targets in the Chollas Creek TMDL (Loading Capacity) that were set equal to the California Department of Fish and Game's water quality criteria for the protection of freshwater aquatic organisms from diazinon. The acute water quality criterion of 0.08 ug/L protects aquatic life from short-term exposure to diazinon, while the chronic criterion of 0.05 ug/L protects aquatic life from long-term diazinon exposure.



OC Pesticides were detected more often at this location than any other location in the Carlsbad HU. There was 21 times that an OC pesticide was detected at CBBUR1, whereas Station CBCWC2, having 9 detections, had the next highest number. OC Pesticides that were detected included aldrin, chlordane (cis), chlordane (gamma), dacthal, DDD(o,p'), DDD(p,p'), DDE(p,p'), DDT(p,p'), dieldrin, endrin, HCH (alpha), HCH (delta), Nonachlor (trans), and oxadiazon. DDE (p,p') and oxadiazon was detected in all four samples,

The Trianzine Herbicides that were detected in a single sample at levels below the RL were propazine, secbumeton, and terbuthylazine.

Toxicity (Table 3-7.2)

The results for one of the water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on ceriodaphnia (young/female) and in another on selenastrum. The march sample of sediment was SL for Hyalella growth and survival.

Table 3-7.1 Monitoring Results Station CBBUR1 – Buena Creek

| STATION 904CBBUR1 | | Threshold Value | Source | SampleDate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 3/12/02 | | 4/23/02 | | 6/3/02 | | 9/17/02 | |
| Analyte | Units | | | Value | Notes | Value | Notes | Value | Notes | Value | Notes |
| **General/Physical** | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 7.41 | | 8.08 | | 8.15 | | 6.59 | |
| Specif. Conduct. | mS/cm | | | 1.627 | | 1.934 | | 1.961 | | 1.834 | |
| Temp. | $^0$C | | | 17.46 | | 15.41 | | 19.19 | | 18.78 | |
| Turbidity | ntu | 20 | BP | ND | | 1.6 | | 3.5 | | 0.54 | |
| Velocity | fps | | | 2 | | 0.48 | | ND | | ND | |
| Sat.Oxygen | % | | | 94.6 | | 91.1 | | 92.5 | | 107.7 | |
| **Inorganics** | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 255 | | 288 | | 311 | | 275 | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | a | 0.38 | | 0.07 | b | 0.07 | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 15.2 | | 16.8 | | 19.4 | | 10.1 | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | a | 1.44 | | 0.37 | b | 0.45 | |
| OrthoPhosphate as P | mg/L | | | 0.174 | | 0.127 | | 0.159 | | 0.127 | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.18 | | 0.12 | | 0.16 | | 0.14 | |
| Sulfate | mg/L | 250 | BP | 280 | | 413 | | 394 | | 404 | |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 7.49 | | 0.676 | | 1.86 | | 0.805 | |
| Arsenic | µg/L | 50 | MCL | 4.4 | | 4.32 | | 1.63 | | 3.95 | |
| Cadmium | µg/L | 4.1/11 | CTR | 0.0[illegible] | | -0.01 | b | 0.0278 | | 0.0212 | |
| Chromium | µg/L | 50 | MCL | [illegible] | | 0.192 | | 0.133 | | 0.211 | |
| Copper | µg/L | 18/29 | CTR | 3.7 | | 4.51 | | 2.21 | | 6.16 | |
| Lead | µg/L | 6.2/160 | CTR | 0.01 | b | -0.01 | b | -0.002 | b | 0.0363 | |
| Manganese | µg/L | 50 | MCL | 35.2 | | 20.1 | | 117 | | 36.8 | |
| Nickel | µg/L | 110/950 | CTR | 0.724 | | 1.27 | | 0.544 | | 0.916 | |
| Selenium | µg/L | 20 | CTR | 3.59 | | 3.67 | | 2.05 | | 3.22 | |
| Silver | µg/L | 14/17 | CTR | -0.01 | b | -0.01 | b | -0.008 | b | 0.0139 | |
| Zinc | µg/L | 240/240 | CTR | 2.15 | | 1.18 | | 1.72 | | 2.22 | |
| **OP Pesticides** | | | | | | | | | | | |
| Demeton-s | µg/L | 0.04/0.1 | MDL/RL | 0.04 | a | -0.04 | b | -0.04 | b | -0.04 | b |
| Diazinon | µg/L | 0.01/0.02 | MDL/RL | -0.005 | b | 0.013 | a | 0.013 | a | 0.017 | |
| Dimethoate | µg/L | 0.03/0.05 | MDL/RL | -0.03 | b | 0.04 | a | -0.03 | b | -0.03 | b |
| Disulfoton | µg/L | 0.01/0.05 | MDL/RL | 0.03 | a | -0.01 | b | -0.01 | b | -0.01 | b |
| Mevinphos | µg/L | 0.03/0.05 | MDL/RL | 0.04 | a | -0.03 | b | -0.03 | b | -0.03 | b |
| Naled(Dibrom) | µg/L | 0.03/0.05 | MDL/RL | 0.04 | a | -0.03 | b | -0.03 | b | -0.03 | b |
| **OC Pesticides** | | | | | | | | | | | |
| Aldrin | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | -0.001 | b | 0.001 | a | -0.001 | b |
| Chlordane, cis | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b |
| Chlordene, gamma | µg/L | 0.001/0.002 | MDL/RL | 0.001 | a | -0.001 | b | -0.001 | b | -0.001 | b |
| Dacthal | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | 0.001 | a | -0.001 | b | 0.00215 | |
| DDD(o,p') | µg/L | 0.001/0.002 | MDL/RL | 0.001 | a | -0.001 | b | -0.001 | b | -0.001 | b |
| DDD(p,p') | µg/L | 0.001/0.002 | MDL/RL | 0.001 | a | -0.001 | b | -0.001 | b | -0.001 | b |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL/RL | 0.006 | | 0.001 | a | 0.002 | | 0.004 | |
| DDT(p,p') | µg/L | 0.002/0.005 | MDL/RL | 0.003 | a | -0.002 | b | -0.002 | b | -0.002 | b |
| Dieldrin | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | -0.001 | b | 0.001 | a | -0.001 | b |
| Endrin | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.00216 | |
| HCH, alpha | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | -0.001 | b | 0.001 | a | -0.001 | b |
| HCH, delta | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b |
| Nonachlor, trans | µg/L | 0.001/0.002 | MDL/RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b |
| Oxadiazon | µg/L | 0.001/0.002 | MDL/RL | 0.001 | a | 0.006 | | 0.007 | | 0.0067 | |
| **Trianzine Herbicides** | | | | | | | | | | | |
| Propazine | µg/L | 0.02/0.05 | MDL/RL | -0.02 | b | 0.035 | a | -0.02 | b | -0.02 | b |
| Secbumeton | µg/L | 0.02/0.05 | MDL/RL | 0.035 | a | -0.02 | b | -0.02 | b | -0.02 | b |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL/RL | 0.035 | a | -0.02 | b | -0.02 | b | -0.02 | b |
| **PCBs** | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | |
| Anthracene | µg/L | 0.02 | RL | -0.02 | | 0.035 | | -0.02 | | -0.0125 | |
| Naphthalene | µg/L | 0.02 | RL | -0.02 | | 0.035 | | -0.02 | | -0.0125 | |
| Phenanthrene | µg/L | 0.02 | RL | -0.02 | | 0.035 | | -0.02 | | -0.0125 | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL

Table 3-7.2 Toxicity Results Station CBBUR1 – Buena Creek

| Station CBBUR1 | Toxicity Species | | | | |
|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | |
| Sample Type: | grab | | grab | integrated | |
| Matrix: | water | | water | sediment | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | |
| Eval Threshold | 80% | | 80% | 80% | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | 10 days |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | Survival (%) |
| Unit | % | Num/Rep | cells/ml | mg/ind | % |
| Rep Count | 10 | 10 | 4 | 8 | 8 |
| **3/12/2002** | | | | | |
| Mean | 100 | 24 | 4438000 | 0.185 | 94 |
| Std Dev | 0 | 7 | 535786 | 0.051 | 7.44 |
| Probability | 0.172 | 0.363 | 0.2[illegible]2 | 0.001 | 0.095 |
| Pct Control | 111.1 | 105 | 93.7 | 201 | 107 |
| Tox Sig Effect Code | NSG | NSG | NSG | SG | NSG |
| **4/23/2002** | | | | | |
| Mean | 100 | 18 | 4106000 | 0.15 | 56 |
| Std Dev | 0 | 10 | 2739784 | 0.055 | 7.44 |
| Probability | 0.5 | 0.147 | 0.259 | 0.002 | 0 |
| Pct Control | 100 | 79.8 | 80.1 | 64.3 | 60 |
| Tox Sig Effect Code | NSG | NSL | NSG | SL | SL |
| **6/4/2002** | | | | | |
| Mean | 90 | 17 | 2838000 | 0.21 | 91 |
| Std Dev | 31.6 | 10 | 173205 | 0.06 | 9.91 |
| Probability | 0.278 | 0.217 | 0 | 0.008 | 0.304 |
| Pct Control | 112.5 | 83.3 | 58 | 146 | 97.3 |
| Tox Sig Effect Code | NSG | NSG | SL | SG | NSG |
| **9/17/2002** | | | | | |
| Mean | 100 | 11 | 7803000 | 0.229 0.2 | 75 74 |
| Std Dev | 0 | 4 | 1058348 | 0.06 0.059 | 20.6 18.5 |
| Probability | 0.5 | 0.02 | 0.048 | 0.045 0.379 | 0.349 0.332 |
| Pct Control | 100 | 66.5 | 119 | 82 96.6 | 95.2 95.3 |
| Tox Sig Effect Code | NSG | SL | SG | SG NSG | NSG NSG |



TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

### 3.4.4 Buena Vista Creek

**Station No. 904CBBVR4** is located in HA 904.21, north of Plaza Camino Real mall, south of Hwy 78, west of S. Vista Way in the City of Carlsbad. (GPS 33.18147N 117.32893W) In April and September, the pH was measured higher than the water quality objective.

Water Chemistry (Table 3-8.1)

Total nitrogen exceeded the Basin Plan objective in only 1 of the 4 samples. The average of the four samples was below the 1.0-mg/L objective. Two of the 4 samples slightly exceeded the sulfate objective, and the average was below the objective. However, water quality thresholds for diazinon, disulfoton, oxadiazon, terbuthylazine were persistently detected.

All four samples detected diazinon concentrations exceeding the MDL with one exceeding the Regional Board numeric targets in the Chollas Creek TMDL that were based on the California Department of Fish and Game's water quality criteria for the protection of freshwater aquatic organisms from diazinon. Three of the four samples detected disulfoton but at unquantifiable levels. Other OC pesticides that were detected, but in single samples, included carbophenothion, demeton-s, methiphos, and Naled(Dibrom).



Oxadiazon was detected in three samples, two of which were above MDL, and terbuthylazine was detected above MDL in two samples. Other OC Pesticides that were detected in single samples were dacthal, DDE (p,p'), endosulfan II, HCH (alpha), HCH (beta), and HCH (gamma).

The Trianzine Herbicides that were detected in a single sample at levels below the RL were atrazine, propazine, and secbumeton. Prometon was detected once and terbuthylazine twice above the RL.

Toxicity (Table 3-8.2)

Both water and sediment samples showed persistence of toxicity. The results for three of the four water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on selenastrum. All four samples of sediment was SL for Hyalella survival with one sample also SL on Hyalella growth.

Table 3-8.1 Monitoring Results Station CBBVR4 - Buena Vista Creek

| STATION 904CBBVR4 | | | | SampleDate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Threshold | | 3/12/02 | | 4/23/02 | | 6/3/02 | | 9/17/02 | |
| Analyte | Units | Value | Source | Values | Notes | Values | Notes | Values | Notes | Values | Notes |
| **General/Physical** | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 7.98 | | 8.58 | | 8.17 | | 8.71 | |
| Specif. Conduct. | mS/cm | | | 2.179 | | 2.285 | | 2.3 | | 2.349 | |
| Temp. | $^0$C | | | 16.11 | | 23.05 | | 21.9 | | 22.16 | |
| Turbidity | ntu | 20 | BP | 3.7 | | 2.8 | | 2 | | 0.85 | |
| Velocity | fps | | | 2.01 | | ND | | ND | | 0 | |
| Sat.Oxygen | % | | | 98.3 | | 203.2 | | 152.4 | | 84.3 | |
| **Inorganics** | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 269 | | 240 | | 238 | | 267 | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | a | 0.41 | | 0.07 | a | 0.098 | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 0.775 | | 0.313 | | 0.128 | c | 0.274 | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | a | 0.37 | a | 0.37 | a | 0.43 | |
| OrthoPhosphate as P | mg/L | | | 0.105 | | 0.055 | | 0.045 | | 0.099 | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.1 | | 0.07 | | 0.06 | | 0.1 | |
| Sulfate | mg/L | 250 | BP | 19 | | 259 | | 242 | | 256 | |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 1. | | 4.4 | | 1.39 | | -0.1 | b |
| Arsenic | µg/L | 50 | MCL | | | 7.24 | | 2.62 | | 7.4 | |
| Cadmium | µg/L | 4.1/1 | CTR | 0.0345 | | 0.0462 | | 0.0106 | | 0.0716 | |
| Chromium | µg/L | 50 | MCL | 1.37 | | 0.354 | | 0.127 | | 0.206 | |
| Copper | µg/L | 18/29 | CTR | 2.12 | | 2.46 | | 1.71 | | 2.26 | |
| Lead | µg/L | 6.2/160 | CTR | -0.01 | b | -0.01 | b | 0.0148 | | 0.0363 | |
| Manganese | µg/L | 50 | MCL | 98.6 | | 64.3 | | 2.85 | | 23.3 | |
| Nickel | µg/L | 110/950 | CTR | 0.516 | | 1.45 | | 0.427 | | 1.55 | |
| Selenium | µg/L | 20 | CTR | 5.53 | | 6.08 | | 2.54 | | 5.25 | |
| Silver | µg/L | 14/17 | CTR | -0.01 | b | -0.01 | b | -0.008 | b | -0.008 | b |
| Zinc | µg/L | 240/240 | CTR | 3.98 | | 1.34 | | 1.48 | | 6.62 | |
| **OP Pesticides** | | | | | | | | | | | |
| Carbophenothion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b,c | -0.03 | b | -0.03 | b |
| Demeton-s | µg/L | 0.04/0.05 | MDL / RL | 0.04 | a | -0.04 | b,c | -0.04 | b | -0.04 | b |
| Diazinon | µg/L | 0.005/0.02 | MDL / RL | 0.039 | | 0.033 | c | 0.033 | | 0.162 | |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | 0.03 | a | 0.03 | a,c | 0.03 | a | -0.01 | b |
| Mevinphos | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b,c | -0.03 | b | -0.03 | b |
| Naled(Dibrom) | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b,c | -0.03 | b | -0.03 | b |
| **OC Pesticides** | | | | | | | | | | | |
| Dacthal | µg/L | 0.001/0.002 | MDL / RL | -0.001 | | 0.001 | b | -0.001 | b | -0.001 | b |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.004 | | -0.001 | b | -0.001 | b |
| Endosulfan II | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.0028 | |
| HCH, alpha | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.0015 | a |
| HCH, beta | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.0015 | a |
| HCH, delta | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | -0.001 | b |
| HCH, gamma | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.002 | | -0.001 | b | -0.001 | b |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | 0.001 | a | 0.011 | | 0.008 | | -0.001 | b |
| **Trianzine Herbicides** | | | | | | | | | | | |
| Atrazine | µg/L | 0.02/0.05 | MDL / RL | 0.035 | a | -0.02 | b | -0.02 | b | -0.02 | b |
| Prometon | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | -0.02 | b | 0.035 | a |
| Propazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | 0.035 | a | -0.02 | b |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | 0.2 | | -0.02 | b | -0.02 | b | -0.02 | b |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | 0.25 | | 0.287 | | -0.02 | b | -0.02 | b |
| **PCBs** | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. Holding time violation occurred, flagged by QAO

Table 3-8.2 Toxicity Results Station CBBVR4 – Buena Vista Creek

| Station CBBVR4 | Toxicity Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | | | |
| Sample Type: | grab | | grab | integrated | | | |
| Matrix: | water | | water | sediment | | | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | | | |
| Eval Threshold | 80% | | 80% | 80% | | | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | | | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | | 10 days | |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | | Survival (%) | |
| Unit | % | Num/Rep | cells/ml | mg/ind | | % | |
| Rep Count | 10 | 10 | 4 | 8 | | 8 | |
| **3/12/2002** | | | | | | | |
| Mean | 100 | 22 | 3823000 | 0.118 | | 53 | |
| Std Dev | 0 | 6 | 170283 | 0.06 | | 37.3 | |
| Probability | 0.172 | 0.349 | 0.[illegible] | 0.171 | | 0.017 | |
| Pct Control | 111.1 | 95.2 | 80.7 | 129 | | 60 | |
| Tox Sig Effect Code | NSG | NSG | SG | NSG | | SL | |
| **4/23/2002** | | | | | | | |
| Mean | 100 | 24 | 3963000 | 0.05 | | 1 | |
| Std Dev | 0 | 10 | 312570 | 0.141 | | 3.54 | |
| Probability | 0.5 | 0.315 | 0.017 | 0.004 | | 0 | |
| Pct Control | 100 | 109 | 77.4 | 21.5 | | 1.33 | |
| Tox Sig Effect Code | NSG | NSG | SL | SL | | SL | |
| **6/4/2002** | | | | | | | |
| Mean | 90 | 16 | 3613000 | 0.114 | | 24 | |
| Std Dev | 31.6 | 6 | 346554 | 0.074 | | 20 | |
| Probability | 0.278 | 0.144 | 0.001 | 0.149 | | 0 | |
| Pct Control | 112.5 | 81.6 | 73.8 | 79.2 | | 25.3 | |
| Tox Sig Effect Code | NSG | NSG | SL | NSL | | SL | |
| **9/17/2002** | | | | | | | |
| Mean | 100 | 11 | 3768000 | 0.348 | 0.17 | 21 | 25 |
| Std Dev | 0 | 2 | 107083 | 0.137 | 0.077 | 20.3 | 13.3 |
| Probability | 0.5 | 0.016 | 0.001 | 0.142 | 0.111 | 0 | 0 |
| Pct Control | 100 | 67.1 | 57.5 | 125 | 81.9 | 27 | 32.9 |
| Tox Sig Effect Code | NSG | SL | SL | NSG | NSG | SL | SL |



TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

### 3.4.5 Cottonwood Creek

**Station No. 904CBCWC2** is located in HA 904.51, between Hwy 1 and Third Street and south of B St., north of tennis courts in the City of Encinitas. (GPS 33.04852N 117.29513W) The site is in a restored reach above Moonlight State Beach. The pH in September exceeded the water quality objective.

Water Chemistry (Table 3-9.1)

Water quality objectives for total nitrogen, total phosphorus, and sulfate were exceeded in all samples. Average levels of total nitrogen, nitrite and nitrate nitrogen at Station CBCWC2 were the highest in the Carlsbad HU, more than twice the levels of the next highest station, CBBUR1 on Buena Creek.

Diazinon exceeded MDL in four samples, with the March sample exceeding CDFG chronic criterion of 0.05 ug/L. Disulfoton was detected but not quantified in three samples. Carbophenothion, dimethoate, and malathion were detected in single samples.



OC Pesticides that were detected only once were dacthal, endosulfan sulfate, HCH (delta), and Nonachlor (trans). DDE (p,p') was detected in two samples, one above and one below the MDL. HCH, alpha was detected in two samples, both below the MDL and oxadiazon was also detected in two samples, both above the MDL.

The Trianzine Herbicides that were detected in a single sample at levels below the RL were propazine, secbumeton and terbuthylazine.

Toxicity (Table 3-9.2)

Both water and sediment samples showed persistence of toxicity. The results for three of the four water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on ceriodaphnia (young/female) and selenastrum. All four samples of sediment was SL for Hyalella survival with one sample also SL on Hyalella growth.

Table 3-9.1 Monitoring Results Station CWC2 – Cottonwood Creek

| STATION 904CCWC2 | | Threshold | | SampleDate | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 03/13/02 | | 04/23/02 | | 06/04/02 | | 09/17/02 | | | | |
| Analyte | Units | Value | Source | Values | Notes | Values | Notes | Values | Notes | Values | Values | Notes | | |
| **General/Physical** | | | | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 7.76 | | 7.6 | | 7.52 | | 9.06 | | | | |
| Specif. Conduct. | mS/cm | | | 4.646 | | 4.925 | | 4.625 | | 4.568 | | | | |
| Temp. | $^0$C | | | 18.75 | | 20.51 | | 19.54 | | 21.17 | | | | |
| Turbidity | ntu | 20 | BP | 2 | | 1.6 | | 1.2 | | 5.6 | | | | |
| Velocity | fps | | | 0.707 | | 1.08 | | 0 | | 0.456 | | | | |
| Sat.Oxygen | % | | | 98.6 | | 124.1 | | 84.5 | | 95.8 | | | | |
| **Inorganics** | | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 158 | | 154 | | 155 | | 154 | | | | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | a | 0.38 | | 0.07 | a | 0.2 | | | | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 31.4 | | 38 | | 40.8 | | 40.3 | | | | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | a | 0.8 | | 0.37 | a | 0.69 | | | | |
| OrthoPhosphate as P | mg/L | | | 0.126 | | 0.139 | | 0.136 | | 0.148 | | | | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.16 | | 0.14 | | 0.19 | | 0.18 | | | | |
| Sulfate | mg/L | 250 | BP | 419 | | 591 | | 542 | | 516 | | | | |
| **Dissolved Metals** | | | | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 3.42 | | 2.82 | | 3.62 | | 1.57 | 1.45 | d | | |
| Arsenic | µg/L | 50 | MCL | 5.13 | | 5.46 | | 6.92 | | 4.28 | 4.19 | d | | |
| Cadmium | µg/L | 4.1/11 | CTR | 0.025 | | 0.0527 | | 0.0529 | | 0.083 | 0.08 | d | | |
| Chromium | µg/L | 50 | MCL | 2.41 | | 0.684 | | 0.334 | | 0.736 | 0.72 | d | | |
| Copper | µg/L | 18/29 | CTR | 3.49 | | 4.16 | | 4.76 | | 4.04 | 4.17 | d | | |
| Lead | µg/L | 6.2/160 | CTR | 0.0175 | | 0.0454 | | 0.0438 | | 0.059 | 0.0591 | d | | |
| Manganese | µg/L | 50 | MCL | 125 | | 21.5 | | 68.7 | | 11.4 | 11.1 | d | | |
| Nickel | µg/L | 110/950 | CTR | 2.23 | | 3.02 | | 2.17 | | 2.25 | 1.96 | d | | |
| Selenium | µg/L | 20 | CTR | 17.7 | | 19.5 | | 6.62 | | 15.2 | 14.7 | d | | |
| Silver | µg/L | 14/17 | CTR | -0.01 | b | -0.01 | b | -0.008 | b | 0.016 | 0.0195 | d | | |
| Zinc | µg/L | 240/240 | CTR | 13.5 | | 7.48 | | 3.42 | | 8.83 | 8.76 | d | | |
| **OP Pesticides** | | | | | | | | | | | | | | |
| Carbophenothion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b | -0.03 | b | -0.03 | | b | | |
| Diazinon | µg/L | 0.02/0.05 | MDL / RL | 0.053 | | 0.0225 | | 0.03 | | 0.0179 | | | | |
| Dimethoate | µg/L | 0.03/0.05 | MDL / RL | -0.03 | b | 0.04 | a | -0.03 | b | -0.03 | | b | | |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | 0.03 | a | 0.03 | a | 0.03 | a | -0.01 | | b | | |
| Malathion | µg/L | 0.03/0.05 | MDL / RL | 0.037 | a | -0.03 | b | -0.03 | b | -0.03 | | b | | |
| **OC Pesticides** | | | | | | | | | | | | | | |
| Dacthal | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b | b | | |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.002 | | 0.001 | a | -0.001 | b | b | | |
| DDT(p,p') | µg/L | 0.001/0.002 | MDL / RL | 0.003 | a | -0.002 | b | 0.003 | a | -0.002 | b | b | | |
| Endosulfan sulfate | µg/L | 0.001/0.002 | MDL / RL | 0.001 | a | -0.001 | b | -0.001 | b | -0.001 | b | b | | |
| HCH, alpha | µg/L | 0.001/0.002 | MDL / RL | 0.001 | a | -0.001 | b | 0.001 | a | -0.001 | b | b | | |
| HCH, delta | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b | b | | |
| Nonachlor, trans | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b | b | | |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | 1.86 | | 0.077 | | -0.001 | b | -0.001 | b | b | | |
| **Trianzine Herbicides** | | | | | | | | | | | | | | |
| Propazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | 0.035 | a | -0.02 | | b | | |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | 0.035 | a | -0.02 | | b | | |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | 0.035 | a | -0.02 | | b | | |
| **PCBs** | | | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | | | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. Holding time violation occurred, flagged by QAO
d. First sample for September is a blind duplicate. September data averaged together before used in calculations

Table 3-9.2 Toxicity Results Station CBCWC2 – Cottonwood Creek

| Station CBCWC2 | Toxicity Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | | | |
| Sample Type: | grab | | grab | integrated | | | |
| Matrix: | water | | water | sediment | | | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | | | |
| Eval Threshold | 80% | | 80% | 80% | | | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | | | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | | 10 days | |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | | Survival (%) | |
| Unit | % | Num/Rep | cell/ml | mg/ind | | % | |
| Rep Count | 10 | 10 | 4 | 8 | | 8 | |
| **3/12/2002** | | | | | | | |
| Mean | 100 | 7 | 1878000 | 0.154 | | 34 | |
| Std Dev | 0 | 3 | 587991 | 0.078 | | 20 | |
| Probability | 0.084 | 0.0 | 0 | 0.036 | | 0 | |
| Pct Control | 125 | 101 | 30.6 | 167 | | 38.6 | |
| Tox Sig Effect Code | NSG | NSG | SL | SG | | SL | |
| **4/23/2002** | | | | | | | |
| Mean | 100 | 5 | 3183000 | 0.186 | | 68 | |
| Std Dev | 0 | 3 | 529497 | 0.083 | | 13.9 | |
| Probability | 0.5 | 0 | 0.002 | 0.089 | | 0 | |
| Pct Control | 100 | 20.2 | 62.1 | 79.9 | | 72 | |
| Tox Sig Effect Code | NSG | SL | SL | NSL | | SL | |
| **6/4/2002** | | | | | | | |
| Mean | 100 | 8 | 3863000 | 0.175 | | 25 | |
| Std Dev | 0 | 3 | 627030 | 0.104 | | 22 | |
| Probability | 0.084 | 0.001 | 0.019 | 0.216 | | 0 | |
| Pct Control | 125 | 38.2 | 78.9 | 122 | | 26.7 | |
| Tox Sig Effect Code | NSG | SL | SL | NSG | | SL | |
| **9/17/2002** | | | | | | | |
| Mean | 100 | 11 | 7313000 | 0.208 | 0 | 10 | 0 |
| Std Dev | 0 | 5 | 1067880 | 0.142 | 0 | 13.1 | 0 |
| Probability | 0.5 | 0.038 | 0.133 | 0.2 | 0 | 0 | 0 |
| Pct Control | 100 | 69.6 | 112 | 74.7 | 0 | 12.7 | 0 |
| Tox Sig Effect Code | NSG | SL | NSG | NSL | SL | SL | SL |



TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

### 3.4.6 Encinitas Creek

**Station 904CBENC2** is located in HA 904.51, accessed via El Camino Real and Leucadia Blvd., within 20' of El Camino Real in the City of Encinitas. (GPS 33.06828N 117.26261W) This station had the lowest average temperature at $15.7^0$. The pH exceeded the water quality objective in September.

Water Chemistry (Table 3-10.1)

Concentrations of total nitrogen slightly exceeded water quality objectives on two occasions, with the average concentration of the four samples slightly below the objective. However, water quality objectives for total phosphorus, and sulfate were persistently exceeded, with average concentrations among the highest in the Carlsbad HU for both consitituents.

OP Pesticides detected a single time were dimethoate, diazathion, and methidathion. All four samples detected diazinon above the MDL with two of the samples exceeding CDFG chronic criterion of 0.05 ug/L. Disulfoton exceeded the MDLs in three samples.



OC Pesticides detected a single time were dacthal, DDE(p,p'), endosulfan I, endosulfan II, and endrin aldehyde. Oxadiazon exceeded the MDLs in three samples Trianzine Herbicides

Terbuthylazine was detected in all four samples, with three samples exceeding the MDL and secbumeton detected at less than the RL in two samples. The other Trianzine Herbicide that was detected a single time was prometon below the RL.

Toxicity (Table 3-10.2)

Water samples showed persistence of toxicity. The results of the April and June samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on ceriodaphnia (young/female). The results for the March sample were SL for ceriodaphnia (survival) and selenastrum. The April sediment sample result was SL for Hyalella (both survival and growth).

Table 3-10.1 Monitoring Results Station CBENC2 – Encinitas Creek

| STATION 904CBENC2 | | Threshold | | SampleDate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 03/13/02 | | 04/23/02 | | | 06/04/02 | | 09/17/02 | |
| Analyte | Units | Value | Source | Values | Notes | Values | Values | Notes | Values | Notes | Values | Notes |
| **General/Physical** | | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 7.61 | | 7.49 | | | 7.58 | | 8.92 | |
| Specif. Conduct. | mS/cm | | | 3.451 | | 4.49 | | | 4.502 | | 3.844 | |
| Temp. | $^0$C | | | 13.23 | | 15.83 | | | 15.8 | | 18 | |
| Turbidity | ntu | 20 | BP | 4.4 | | 7 | | | 6.45 | | 4.7 | |
| Velocity | fps | | | 0.255 | | 0 | | | 0 | | 0 | |
| Sat.Oxygen | % | | | 70.9 | | 89.5 | | | 72.4 | | 82.8 | |
| **Inorganics** | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 262 | | 268 | | | 275 | | 259 | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | a | 0.32 | | | 0.07 | a | 0.077 | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 0.298 | | 0.513 | | | 0.442 | | 0.413 | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | a | 0.72 | | | 0.37 | a | 0.64 | |
| OrthoPhosphate as P | mg/L | | | 0.116 | | 0.161 | | | 0.215 | | 0.32 | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.18 | | [illegible]23 | | | 0.31 | | 0.38 | |
| Sulfate | mg/L | 250 | BP | 683 | | [illegible]926 | | | 938 | | 869 | |
| **Dissolved Metals** | | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 1[illegible] | | 1.57 | 1.49 | d | 6.2 | | 0.427 | |
| Arsenic | µg/L | 50 | MCL | [illegible] | | 4.28 | 4.4 | d | 6.08 | | 3.84 | |
| Cadmium | µg/L | 4.1/11 | CTR | [illegible]106 | | -0.01 | -0.01 | b,d | 0.0476 | | 0.03 | |
| Chromium | µg/L | 50 | MCL | [illegible]99 | | 0.465 | 0.479 | d | 0.37 | | 0.503 | |
| Copper | µg/L | 18/29 | CTR | 3.3 | | 3.7 | 3.63 | d | 4.31 | | 3.6 | |
| Lead | µg/L | 6.2/160 | CTR | -0.01 | b | -0.01 | 0.0144 | b,d | 0.0719 | | 0.0541 | |
| Manganese | µg/L | 50 | MCL | 246 | | 278 | 274 | d | 86.7 | | 205 | |
| Nickel | µg/L | 110/950 | CTR | 2.2 | | 3.45 | 3.45 | d | 2.17 | | 4.05 | |
| Selenium | µg/L | 20 | CTR | 10.5 | | 10.2 | 10.1 | d | 8.09 | | 8.89 | |
| Silver | µg/L | 14/17 | CTR | -0.01 | b | -0.02 | -0.01 | b,d | -0.008 | | -0.008 | b |
| Zinc | µg/L | 240/240 | CTR | 12.3 | | 11.6 | 11.6 | d | 4.22 | | 16.6 | |
| **OP Pesticides** | | | | | | | | | | | | |
| Diazinon | µg/L | 0.02/0.05 | MDL / RL | 0.4 | | 0.0632 | | | 0.051 | | 0.04 | |
| Dimethoate | µg/L | 0.03/0.05 | MDL / RL | -0.03 | b | 0.04 | | a | -0.03 | b | -0.03 | b |
| Dioxathion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | | b | -0.03 | b | -0.03 | b |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | 0.113 | | 0.095 | | | 0.074 | | -0.01 | b |
| Methidathion | µg/L | 0.03/0.05 | MDL / RL | -0.03 | b | 0.04 | | a | -0.03 | b | -0.03 | b |
| **OC Pesticides** | | | | | | | | | | | | |
| Dacthal | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | | a | -0.001 | b | -0.001 | b |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.01 | | | -0.001 | b | -0.001 | b |
| Endosulfan I | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | | a | -0.001 | b | -0.001 | b |
| Endosulfan II | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | | a | -0.001 | b | -0.001 | b |
| Endrin Aldehyde | µg/L | 0.001/0.002 | MDL / RL | -0.002 | b | 0.007 | | | -0.002 | b | -0.002 | b |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | 0.142 | | 0.057 | | | 0.053 | | -0.001 | b |
| **Trianzine Herbicides** | | | | | | | | | | | | |
| Prometon | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | | b | -0.02 | b | 0.038 | a |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | 0.25 | | -0.02 | | b | 0.035 | a | -0.02 | b |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | 0.5 | | 1.65 | | | 0.55 | | 0.035 | a |
| **PCBs** | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. Holding time violation occurred, flagged by QAO
d. First sample for April is a blind duplicate. April data averaged together before used in calculations

Table 3-10.2 Toxicity Results Station CBENC2 – Encinitas Creek

| Station CBENC2 | Toxicity Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | | | |
| Sample Type: | grab | | grab | integrated | | | |
| Matrix: | water | | water | sediment | | | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | | | |
| Eval Threshold | 80% | | 80% | 80% | | | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | | | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | | 10 days | |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | | Survival (%) | |
| Unit | % | Num/Rep | cells/ml | mg/ind | | % | |
| Rep Count | 10 | 10 | 4 | 8 | | 8 | |
| **3/12/2002** | | | | | | | |
| Mean | 0 | (1) | 4283000 | 0.151 | | 85 | |
| Std Dev | 0 | (1) | 2294 | 0.086 | | 9.26 | |
| Probability | 0 | (1) | 1.0 | 0.054 | | 0.309 | |
| Pct Control | 0 | (1) | 70.4 | 164 | | 97.1 | |
| Tox Sig Effect Code | SL | NA | SL | NSG | | NSG | |
| **4/23/2002** | | | | | | | |
| Mean | 90 | 11 | 4813000 | 0.091 | | 74 | |
| Std Dev | 31.6 | 4 | 268017 | 0.03 | | 11.9 | |
| Probability | 0.5 | 0.001 | 0.224 | 0 | | 0.001 | |
| Pct Control | 90 | 48.3 | 93.9 | 39.3 | | 78.7 | |
| Tox Sig Effect Code | NSG | SL | NSG | SL | | SL | |
| **6/4/2002** | | | | | | | |
| Mean | 100 | 12 | 4198000 | 0.133 | | 81 | |
| Std Dev | 0 | 5 | 364600 | 0.03 | | 12.5 | |
| Probability | 0.084 | 0.008 | 0.016 | 0.196 | | 0.02 | |
| Pct Control | 125 | 58.4 | 85.8 | 92.3 | | 86.7 | |
| Tox Sig Effect Code | NSG | SL | SG | NSG | | SG | |
| **9/17/2002** | | | | | | | |
| Mean | 100 | 21 | 6678000 | 0.17 | 0.211 | 90 | 66 |
| Std Dev | 0 | 6 | 821787 | 0.03 | 0.078 | 12 | 20 |
| Probability | 0.5 | 0.044 | 0.402 | 0 | 0.452 | 0.074 | 0.109 |
| Pct Control | 100 | 132 | 102 | 61.1 | 102 | 115 | 85.6 |
| Tox Sig Effect Code | NSG | SG | NSG | SL | NSG | NSG | NSG |



Note: (1) No surviving adults

TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

**Escondido Creek**

**Station No. 904CBESC5** is located in HA 904.62, within the Elfin Forest Recreational Reserve, 9200 Harmony Grove Road. (GPS 33.08559N 117.15037W) The pH water quality objective was exceeded on two occasions.

Water Chemistry (Table 3-11.1)

Water quality objectives for total nitrogen and sulfate were exceeded in all samples. Total phosphorus was exceeded in half the samples, but the average for all samples was slightly below the objective.

Diazinon exceeded the MDL in all samples with the results of the April 24 sample exceeding both CDFG chronic and acute criteria. Disulfoton was detected on 3 of the 4 dates, but all below the MDL. Oxadiazon was detected and quantified on three of the four dates and in the test sample but not the field blank of the fourth date. Atrazine was detected in April but below the RL and in the March field blank, but not the sample. Secbumeton was detected in March and June and terbuthylazine in March, April and June. Dimethoate, dioxathion, aldrin, endosulfan II, endrin aldehyde, HCH (beta), HCH (delta), and prometon were all detected a single time.



Toxicity: (Table 3-11.2)

One of the four water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on ceriodaphnia (survival) and one sample of sediment was SL for Hyalella (growth). Water and sediment samples did not show a persistence of toxicity.

## Table 3-11.1 Monitoring Results Station CBESC5 – Escondido Creek

| STATION 904CESC5 | | Threshold Value | Source | SampleDate | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 03/13/02 | | | 04/23/02 | | | 06/04/02 | | | 09/17/02 | | |
| Analyte | Units | | | Values | Values | Notes | Values | Values | Notes | Values | Values | Notes | Values | Values | Notes |
| **General/Physical** | | | | | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 8.54 | | | 8.18 | | | 8.77 | | | 7 | | |
| Specif. Conduct. | mS/cm | | | 1.908 | | | 1.963 | | | 1.864 | | | 1.819 | | |
| Temp. | $^0$C | | | 12.1 | | | 16.31 | | | 21.8 | | | 19.15 | | |
| Turbidity | ntu | 20 | BP | 0.81 | | | 0.4 | | | 0.74 | | | 2.4 | | |
| Velocity | fps | | | 1.74 | | | 0.768 | | | 0.562 | | | 0.342 | | |
| Sat.Oxygen | % | | | 100 | | | 101.5 | | | 143.3 | | | 126.5 | | |
| **Inorganics** | | | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 289 | 298 | d | 295 | 297 | d | 257 | 257 | d | 286 | 286 | d |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | 0.07 | a,d | 0.07 | 0.11 | a,d | 0.07 | 0.07 | a,d | 0.061 | 0.068 | d |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 6.38 | 6.28 | d | 6.91 | 6.9 | d | 6.16 | 6 | d | 7.65 | 6.28 | d |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | 0.37 | a,d | 0.37 | 0.37 | a,d | 0.57 | 0.37 | a,d | 0.38 | 0.45 | d |
| OrthoPhosphate as P | mg/L | | | 0.12 | 0.126 | d | 0.074 | 0.074 | d | 0.025 | 0.027 | d | 0.0864 | 0.087 | d |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.12 | 0.13 | d | 0.08 | 0.08 | d | 0.04 | 0.04 | a,d | 0.138 | 0.113 | d |
| Sulfate | mg/L | 250 | BP | 326 | 312 | d | 426 | 431 | d | 390 | 374 | d | 372 | 386 | d |
| **Dissolved Metals** | | | | | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 1.04 | 1.04 | d | [illegible] | 0.852 | d | 1 | 6.81 | d | -0.1 | -0.1 | b,d |
| Arsenic | µg/L | 50 | MCL | 1.93 | 2.08 | d | 1.62 | 1.64 | d | 1.88 | 5.66 | d | 1.91 | 1.7 | d |
| Cadmium | µg/L | 4.1/11 | CTR | 0.0434 | [illegible] | d | [illegible] | 0.0161 | d | 0.0152 | 0.059 | d | 0.0482 | 0.0457 | d |
| Chromium | µg/L | 50 | MCL | 3.86 | [illegible] | d | 1.42 | 1.38 | d | 0.082 | 0.396 | d | 0.909 | 0.93 | d |
| Copper | µg/L | 18/29 | CTR | 3.04 | [illegible] | d | 3.4 | 3.33 | d | 1.89 | 4.18 | d | 2.7 | 2.72 | d |
| Lead | µg/L | 6.2/160 | CTR | -0.01 | [illegible] | b,d | -0.01 | -0.01 | b,d | -0.002 | 0.0524 | b,d | 0.0342 | 0.0363 | d |
| Manganese | µg/L | 50 | MCL | 12.7 | 13 | d | 2.68 | 2.65 | d | 109 | 95 | d | 14.4 | 14.9 | d |
| Nickel | µg/L | 110/950 | CTR | 0.[illegible] | 0.698 | d | 0.706 | 0.686 | d | 0.564 | 2.48 | d | 1.92 | 1.84 | d |
| Selenium | µg/L | 20 | CTR | 5.22 | 5.65 | d | 4.3 | 4.36 | d | 1.43 | 7.66 | d | 5.79 | 5.08 | d |
| Silver | µg/L | 14/17 | CTR | -0.01 | -0.01 | b,d | -0.01 | -0.01 | b,d | 0.0147 | -0.008 | b,d | -0.008 | -0.008 | b,d |
| Zinc | µg/L | 240/240 | CTR | 9.45 | 9.74 | d | 4.4 | 4.67 | d | 1.39 | 3.75 | d | 4.46 | 4.38 | d |
| **OP Pesticides** | | | | | | | | | | | | | | | |
| Diazinon | µg/L | 0.02/0.05 | MDL / RL | 0.044 | 0.037 | | 0.295 | 0.325 | | 0.028 | 0.037 | | 0.025 | 0.029 | |
| Dimethoate | µg/L | 0.03/0.05 | MDL / RL | -0.03 | -0.03 | b,d | 0.04 | 0.04 | a,d | -0.03 | -0.03 | b,d | -0.03 | -0.03 | b,d |
| Dioxathion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | 0.04 | b,d | -0.03 | -0.03 | b,d | -0.03 | -0.03 | b,d | -0.03 | -0.03 | b,d |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | 0.03 | 0.03 | a,d | 0.03 | 0.03 | a,d | 0.03 | 0.03 | a,d | -0.01 | -0.01 | b,d |
| Tetrachlorvinphos | µg/L | 0.03/0.05 | MDL / RL | -0.03 | -0.03 | b,d | -0.03 | 0.04 | a,b,d | -0.03 | -0.03 | b,d | -0.03 | -0.03 | b,d |
| **OC Pesticides** | | | | | | | | | | | | | | | |
| Aldrin | µg/L | 0.001/0.002 | MDL / RL | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | -0.001 | 0.001 | a,d | -0.001 | -0.001 | b,d |
| Dacthal | µg/L | 0.001/0.002 | MDL / RL | -0.001 | -0.001 | b,d | 0.001 | 0.001 | a,d | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | -0.001 | b,d | 0.003 | 0.003 | d | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d |
| DDT(p,p') | µg/L | 0.002/0.005 | MDL / RL | -0.002 | -0.002 | b,d | -0.002 | -0.002 | b,d | 0.003 | 0.003 | a,d | -0.002 | -0.002 | b,d |
| Endosulfan II | µg/L | 0.001/0.002 | MDL / RL | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | -0.001 | 0.0035 | d |
| Endrin Aldehyde | µg/L | 0.002/0.005 | MDL / RL | -0.002 | -0.002 | b,d | 0.003 | -0.002 | d | -0.002 | -0.002 | b,d | -0.002 | -0.002 | b,d |
| HCH, alpha | µg/L | 0.001/0.002 | MDL / RL | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | 0.001 | 0.001 | a,d | -0.001 | -0.001 | b,d |
| HCH, beta | µg/L | 0.001/0.002 | MDL / RL | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | -0.001 | 0.016 | d |
| HCH, delta | µg/L | 0.001/0.002 | MDL / RL | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | -0.001 | -0.001 | b,d | -0.001 | 0.002 | d |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | 0.025 | 0.024 | d | 0.011 | 0.013 | d | 0.0125 | 0.014 | d | 0.012 | -0.001 | d |
| **Trianzine Herbicides** | | | | | | | | | | | | | | | |
| Atrazine | µg/L | 0.02/0.05 | MDL / RL | 0.035 | -0.02 | a,b,d | 0.035 | 0.035 | a,d | -0.02 | -0.02 | b,d | -0.02 | -0.02 | b,d |
| Prometon | µg/L | 0.02/0.05 | MDL / RL | -0.02 | -0.02 | b,d | -0.02 | -0.02 | b,d | 0.035 | -0.02 | a,b,d | -0.02 | -0.02 | b,d |
| Propazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | -0.02 | b,d | -0.02 | -0.02 | b,d | 0.035 | 0.035 | a,d | -0.02 | -0.02 | b,d |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | 0.035 | 0.1 | a,d | -0.02 | -0.02 | b,d | 0.152 | 0.167 | d | -0.02 | -0.02 | b,d |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | 0.1 | 0.035 | a,d | 0.035 | -0.02 | a,b,d | 0.178 | 0.187 | d | -0.02 | -0.02 | b,d |
| **PCBs** | | | | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | | | | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. Holding time violation occurred, flagged by QAO
d. First sample is a blind duplicate. Data averaged together before used in calculations

Table 3-11.2 Toxicity Results Station CBESC5 – Escondido Creek

| Station CBESC5 | Toxicity Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | | | |
| Sample Type: | grab | | grab | integrated | | | |
| Matrix: | water | | water | sediment | | | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | | | |
| Eval Threshold | 80% | | 80% | 80% | | | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | | | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | | 10 days | |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | | Survival (%) | |
| Unit | % | Num/Rep | cells/ml | mg/ind | | % | |
| Rep Count | 10 | 10 | 4 | 8 | | 8 | |
| **3/12/2002** | | | | | | | |
| Mean | 100 | 33 | 5098000 | 0.131 | | 71 | |
| Std Dev | 0 | 9 | 667433 | 0.034 | | 18.1 | |
| Probability | 0.084 | 0 | 0.024 | 0.023 | | 0.025 | |
| Pct Control | 125 | 194 | 83.1 | 143 | | 81.4 | |
| Tox Sig Effect Code | NSG | SG | SG | SG | | SG | |
| **4/23/2002** | | | | | | | |
| Mean | 30 | 24 | 5938000 | 0.148 | | 81 | |
| Std Dev | 48.3 | 15 | 366788 | 0.05 | | 17.3 | |
| Probability | 0.001 | 0.316 | 0.057 | 0.001 | | 0.046 | |
| Pct Control | 30 | 82.7 | 91.8 | 63.7 | | 86.7 | |
| Tox Sig Effect Code | SL | NSG | NSG | SL | | SG | |
| **6/4/2002** | | | | | | | |
| Mean | 100 | 22 | 4818000 | 0.23 | | 91 | |
| Std Dev | 0 | 8 | 268080 | 0.025 | | 17.3 | |
| Probability | 0.084 | 0.278 | 0.371 | 0 | | 0.362 | |
| Pct Control | 125 | 111 | 98.5 | 159 | | 97.3 | |
| Tox Sig Effect Code | NSG | NSG | NSG | SG | | NSG | |
| **9/17/2002** | | | | | | | |
| Mean | 90 | 22 | 8593000 | 0.229 | 0.22 | 84 | 79 |
| Std Dev | 31.6 | 5 | 877477 | 0.052 | 0.027 | 13 | 18.5 |
| Probability | 0.5 | 0.408 | 0.062 | 0.034 | 0.159 | 0.256 | 0.407 |
| Pct Control | 100 | 97.4 | 116 | 82.2 | 106 | 107 | 103 |
| Tox Sig Effect Code | NSG | NSG | NSG | SG | NSG | NSG | NSG |



TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

**Station 904CBESC8** is located in HA 904.61, downstream side of the La Bajada - Rancho Santa Fe bridge in the community of Rancho Santa Fe. (GPS 33.03393N 117.23565W) The pH of 11.6 recorded on September 17th was the highest of all sampling events in the Carlsbad HU.

Water Chemistry (Table 3-12.1)

Water quality objectives for total nitrogen, total phosphorus, and sulfate were exceeded in all samples. Total phosphorus was exceeded in half the samples, but the average for all samples was slightly below the objective.



Diazinon was detected in all samples with all the samples quantifiable, with the April sample exceeding both CDFG chronic and acute criteria. Secbumeton and terbuthylazine were detected at quantifiable levels in March and June and terbuthylazine in June, but at levels between the MDL and RL. Dimethoate, dioxathion, chlordene (gamma), dacthal, DDD(p,p'), DDE(p,p'), DDT(p,p'), endosulfan II, atrazine, prometon and propazine were all detected a single time

Toxicity (Table 3-12.2)

Water samples did not, but sediment did show a persistence of toxicity. Six of the 12 test results on water samples were significant compared to negative control based on statistical test, alpha of less than 5%, but none were less than the evaluation threshold. The results of the April and September sediment samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on Hyalella (growth). The September sample was also SL for Hydlella (survival).

Table 3-12.1 Monitoring Results Station CBESC8 – Escondido Creek

| STATION 904CESC8 | | Threshold | | SampleDate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 03/13/02 | | 04/24/02 | | 06/04/02 | | 09/17/02 | |
| Analyte | Units | Value | Source | Values | Notes | Values | Notes | Values | Notes | Values | Notes |
| **General/Physical** | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | | | 7.68 | | 7.97 | | 11.62 | |
| Specif. Conduct. | mS/cm | | | 2.162 | | 2.36 | | 2.28 | | 2.013 | |
| Temp. | $^0$C | | | 15.38 | | 15.21 | | 18.01 | | 18.88 | |
| Turbidity | ntu | 20 | BP | | | 6.6 | | 6.4 | | 9.42 | |
| Velocity | fps | | | 0.876 | | 0.788 | | 0.59 | | 1.47 | |
| Sat.Oxygen | % | | | 80.1 | | 67.8 | | 84.1 | | 102.5 | |
| **Inorganics** | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 276 | | 285 | | 252 | | 248 | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | a | 0.07 | a | 0.07 | a | 0.075 | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 2.5 | | 2.85 | | 1 | | 1.5 | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | a | 0.56 | | 0.5 | | 0.38 | |
| OrthoPhosphate as P | mg/L | | | 0.126 | | 0.128 | | 0.096 | | 0.088 | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.15 | | 0.16 | | 0.13 | | 0.12 | |
| Sulfate | mg/L | 250 | BP | 332 | | 507 | | 454 | | 438 | |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 5.94 | | 3.90 | | 1 | | 32.88 | |
| Arsenic | µg/L | 50 | MCL | 1.89 | | 1.87 | | 1.98 | | 2.02 | |
| Cadmium | µg/L | 4.1/11 | CTR | 0.026 | | 0.048 | | 0.017 | | 0.065 | |
| Chromium | µg/L | 50 | MCL | 3.80 | | 0.43 | | 0.12 | | 1.19 | |
| Copper | µg/L | 18/29 | CTR | 2.94 | | 3.17 | | 2.06 | | 2.45 | |
| Lead | µg/L | 6.2/160 | CTR | -0.01 | b | -0.01 | b | -0.002 | b | 0.027 | |
| Manganese | µg/L | 50 | MCL | 131 | | 153 | | 116 | | 88 | |
| Nickel | µg/L | 110/950 | CTR | 0.64 | | 1.19 | | 0.59 | | 2.13 | |
| Selenium | µg/L | 20 | CTR | 5.46 | | 5.09 | | 1.72 | | 5.55 | |
| Silver | µg/L | 14/17 | CTR | -0.010 | b | -0.01 | b | -0.008 | b | -0.008 | b |
| Zinc | µg/L | 240/240 | CTR | 3.14 | | 2.29 | | 1.39 | | 2.75 | |
| **OP Pesticides** | | | | | | | | | | | |
| Diazinon | µg/L | 0.02/0.05 | MDL / RL | 0.065 | | 0.225 | | 0.013 | | 0.013 | |
| Dimethoate | µg/L | 0.03/0.05 | MDL / RL | -0.03 | b | 0.04 | | -0.03 | b | -0.03 | b |
| Dioxathion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | | -0.03 | b | -0.03 | b | -0.03 | b |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | 0.03 | | 0.03 | | 0.03 | | -0.01 | b |
| **OC Pesticides** | | | | | | | | | | | |
| Chlordene, gamma | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.006 | |
| Dacthal | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | b | -0.001 | b |
| DDD(p,p') | µg/L | 0.001/0.002 | MDL / RL | 0.001 | a | -0.001 | b | -0.001 | b | -0.001 | b |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.002 | | -0.001 | b | -0.001 | b |
| DDT(p,p') | µg/L | 0.002/0.005 | MDL / RL | -0.002 | b | -0.002 | b | 0.003 | a | -0.002 | b |
| Endosulfan II | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.00375 | a |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | 0.018 | | 0.013 | | 0.011 | | -0.001 | b |
| **Trianzine Herbicides** | | | | | | | | | | | |
| Atrazine | µg/L | 0.02/0.05 | MDL / RL | 0.035 | a | -0.02 | b | -0.02 | b | -0.02 | b |
| Prometon | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | -0.02 | b | 0.022 | |
| Propazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | 0.035 | a | -0.02 | b |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | 0.12 | | -0.02 | b | 0.14 | | -0.02 | b |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | 0.15 | | 0.035 | | 0.15 | | -0.02 | b |
| **PCBs** | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. Holding time violation occurred, flagged by QAO
d. First sample is a blind duplicate. Data averaged together before used in calculations

Table 3-12.2 Toxicity Results Station CBESC8 – Escondido Creek

| Station CBESC8 | Toxicity Species | | | | | | |
|---|---|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | | | |
| Sample Type: | grab | | grab | integrated | | | |
| Matrix: | water | | water | sediment | | | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | | | |
| Eval Threshold | 80% | | 80% | 80% | | | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | | | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | | 10 days | |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | | Survival (%) | |
| Unit | % | Num/Rep | cells/ml | mg/ind | | % | |
| Rep Count | 10 | 10 | 4 | 8 | | 8 | |
| **3/12/2002** | | | | | | | |
| Mean | 100 | 33 | 5378000 | 0.221 | | 90 | |
| Std Dev | 0 | 11 | 198[illegible]97 | 0.043 | | 7.56 | |
| Probability | 0.084 | 0.001 | 0.0[illegible] | 0 | | 0.295 | |
| Pct Control | 125 | 196 | [illegible]877 | 240 | | 103 | |
| Tox Sig Effect Code | NSG | [illegible]G | [illegible]G | SG | | NSG | |
| **4/23/2002** | | | | | | | |
| Mean | 80 | [illegible]0 | 5623000 | 0.15 | | 81 | |
| Std Dev | 42.2 | 4 | 408371 | 0.062 | | 16.4 | |
| Probability | 0.084 | 0.322 | 0.015 | 0.004 | | 0.04 | |
| Pct Control | 80 | 104 | 86.9 | 64.3 | | 86.7 | |
| Tox Sig Effect Code | NSG | NSG | SG | SL | | SG | |
| **6/4/2002** | | | | | | | |
| Mean | 100 | 29 | 4148000 | 0.252 | | 78 | |
| Std Dev | 0 | 8 | 316228 | 0.128 | | 32.8 | |
| Probability | 0.084 | 0.013 | 0.009 | 0.025 | | 0.107 | |
| Pct Control | 125 | 145 | 84.8 | 174 | | 82.7 | |
| Tox Sig Effect Code | NSG | SG | SG | SG | | NSG | |
| **9/17/2002** | | | | | | | |
| Mean | 90 | 18 | 7553000 | 0.186 | 0.264 | 44 | 90 |
| Std Dev | 31.6 | 8 | 797392 | 0.046 | 0.033 | 15.1 | 16.9 |
| Probability | 0.172 | 0.312 | 0.046 | 0.001 | 0.001 | 0 | 0.062 |
| Pct Control | 90 | 110 | 115 | 66.9 | 127 | 55.7 | 116 |
| Tox Sig Effect Code | NSG | NSG | SG | SL | SG | SL | NSG |



TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

### 3.4.7 Loma Alta Creek

**Station No. 904CBLAC3** is located in HA 904.10 just upstream of El Camino Real in the City of Oceanside. (GPS 33.19993N 117.33008W) The pH water quality objective was exceeded in September.

Water Chemistry (Table 3-13.1)

This was the only station in the watershed where concentrations of total nitrogen, total phosphorus and sulfate in all samples were below water quality objectives. Azinphos methyl, carbophenothion, demeton-s, mevinphos, naled(Dibrom) were all detected on March 12, but at levels between the MDL and RL. Diazinon was detected in March and June, with the March sample exceeding CDFG chronic criterion of 0.05 ug/L. Disulfoton exceeded the RL in March and the MDL in June. Atrazine was detected and quantifiable in March, June and September. DDE(p,p') was above the MDL, Endosulfan I, Endrin Aldehyde, HCH alpha, HCH beta, HCH delta and HCH gamma between the RL and MDL in April. Oxadiazon was above the MDL in April and June. Prometron was detected above the RL in June and September and between the RL and MDL in April. Propazine was detected between the RL and MDL in June and Secbumeton exceeded the RL in March and was between the MDL and RL in April. Terbuthylazine exceeded the RL in March.



Toxicity (Table 3-13.2)

Water samples showed persistence of toxicity. The results for three of the four water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on ceriodaphnia (young/female) and four of four sample for selenastrum. The September sediment sample was SL for Hyalella (survival).

Table 3-13.1 Monitoring Results Station CBLAC – Loma Alta Creek

| STATION 904CBLAC5 | | Threshold | | SampleDate | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 03/12/02 | | 04/22/02 | | 06/03/02 | | | 09/16/02 | | |
| Analyte | Units | Value | Source | Values | Notes | Values | Notes | Values | Values | Notes | Values | Notes | |
| **General/Physical** | | | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 7.89 | | 8 | | 7.51 | | | 9.97 | | |
| Specif. Conduct. | mS/cm | | | 3.973 | | 4.351 | | 4.631 | | | 4.705 | | |
| Temp. | $^0$C | | | 15.87 | | 19.78 | | 21.79 | | | 23.16 | | |
| Turbidity | ntu | 20 | BP | 0.87 | | 0.8 | | 1 | | | 2.1 | | |
| Velocity | fps | | | 0.518 | | 0 | | 0 | | | 0 | | |
| Sat.Oxygen | % | | | 98.1 | | 168.7 | | 153.2 | | | 154.3 | | |
| **Inorganics** | | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 310 | | 298 | | 329 | | | 298 | | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | a | 0.38 | | 0.07 | | a | 0.11 | | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 0.086 | e | 0.176 | | 0.146 | | e | 0.109 | e | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | a | 0.5 | | 0.37 | | a | 0.47 | | |
| OrthoPhosphate as P | mg/L | | | 0.032 | | 0.05 | | 0.034 | | | 0.019 | | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.04 | a | 0.04 | a | 0.04 | | a | -0.03 | b | |
| Sulfate | mg/L | 250 | BP | 191 | | 250 | | 240 | | | 204 | | |
| **Dissolved Metals** | | | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 1.4 | | 5.87 | | 0.67 | 1.28 | d | -0.1 | b | |
| Arsenic | µg/L | 50 | MCL | 4.44 | | 5.63 | | 12.7 | 6.33 | d | 4.85 | | |
| Cadmium | µg/L | 4.1/11 | CTR | 0.023 | | -0.01 | b | 0.0156 | 0.274 | d | 0.0177 | | |
| Chromium | µg/L | 50 | MCL | 1.72 | | 0.396 | | 0.498 | 1.19 | d | 0.423 | | |
| Copper | µg/L | 18/29 | CTR | 1.68 | | 2.58 | | 1.94 | 3.36 | d | 2.27 | | |
| Lead | µg/L | 6.2/160 | CTR | -0.01 | b | -0.01 | b | 0.0146 | 2.41 | d | 0.0074 | | |
| Manganese | µg/L | 50 | MCL | 123 | | 64.1 | | 157 | 84.6 | d | 208 | | |
| Nickel | µg/L | 110/950 | CTR | 0.67 | | 1.99 | | 3.51 | 4.43 | d | 3.14 | | |
| Selenium | µg/L | 20 | CTR | 10 | | 12 | | 14.8 | 12.7 | d | 12.3 | | |
| Silver | µg/L | 14/17 | CTR | -0.01 | b | -0.01 | b | 0.234 | -0.008 | b,d | -0.008 | b | |
| Zinc | µg/L | 240/240 | CTR | 1.86 | | -0.01 | b | 3.65 | 1.32 | d | 1.58 | | |
| **OP Pesticides** | | | | | | | | | | | | | |
| Azinphos methyl | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b,c | -0.03 | | b | -0.03 | b | |
| Carbophenothion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b,c | -0.03 | | b | -0.03 | b | |
| Demeton-s | µg/L | 0.04/0.05 | MDL / RL | 0.04 | a | -0.04 | b,c | -0.04 | | b | -0.04 | b | |
| Diazinon | µg/L | 0.02/0.05 | MDL / RL | 0.062 | | 0.045 | c | 0.024 | | | -0.005 | b | |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | 0.138 | | 0.125 | c | 0.03 | | a | -0.01 | b | |
| Mevinphos | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b,c | -0.03 | | b | -0.03 | b | |
| Naled(Dibrom) | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b,c | -0.03 | | b | -0.03 | b | |
| **OC Pesticides** | | | | | | | | | | | | | |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.005 | | -0.001 | | b | -0.001 | b | |
| Endosulfan I | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | | b | -0.001 | b | |
| Endrin Aldehyde | µg/L | 0.002/0.005 | MDL / RL | -0.002 | b | 0.003 | a | -0.002 | | b | -0.002 | b | |
| HCH, alpha | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | | b | -0.001 | b | |
| HCH, beta | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | | b | -0.001 | b | |
| HCH, delta | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | | b | -0.001 | b | |
| HCH, gamma | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.001 | a | -0.001 | | b | -0.001 | b | |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.006 | | 0.01 | | b | -0.001 | b | |
| **Trianzine Herbicides** | | | | | | | | | | | | | |
| Atrazine | µg/L | 0.02/0.05 | MDL / RL | 0.1 | | -0.02 | b | -0.02 | | b | -0.02 | b | |
| Prometon | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | 0.035 | a | 0.112 | | | 0.045 | | |
| Propazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | 0.035 | | a | -0.02 | b | |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | 0.43 | | 0.035 | a | -0.02 | | b | -0.02 | b | |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | 0.61 | | -0.02 | b | -0.02 | | b | -0.02 | b | |
| **PCBs** | | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | | |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. Holding time violation occurred, flagged by QAO
d. First sample is a blind duplicate. Data averaged together before used in calculations
e. Laboratory Contamination

Table 3-13.2 Toxicity Results Station CBLAC2 – Loma Alta Creek

| Station CBLAC3 | Toxicity Species | | | | |
|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | |
| Sample Type: | grab | | grab | integrated | |
| Matrix: | water | | water | sediment | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | |
| Eval Threshold | 80% | | 80% | 80% | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | 10 days |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | Survival (%) |
| Unit | % | Num/Rep | cells/ml | mg/ind | % |
| Rep Count | 10 | 10 | 4 | 8 | 8 |
| **3/12/2002** | | | | | |
| Mean | 80 | 14 | 1128000 | 0.263 | 90 |
| Std Dev | 42.2 | 6 | 78316 | 0.038 | 9.26 |
| Probability | 0.278 | 0.004 | 0 | 0 | 0.309 |
| Pct Control | 88.9 | 61.7 | 23.8 | 286 | 103 |
| Tox Sig Effect Code | NSG | SL | SL | SG | NSG |
| **4/23/2002** | | | | | |
| Mean | 80 | 8 | 1218000 | 0.194 | 86 |
| Std Dev | 42.2 | 4 | 129099 | 0.038 | 17.7 |
| Probability | 0.084 | 0 | 0.001 | 0.031 | 0.148 |
| Pct Control | 80 | 37 | 23.8 | 83.3 | 92 |
| Tox Sig Effect Code | NSG | SL | SL | SG | NSG |
| **6/4/2002** | | | | | |
| Mean | 50 | 8 | 938000 | 0.251 | 99 |
| Std Dev | 52.7 | 3 | 108934 | 0.037 | 3.54 |
| Probability | 0.089 | 0.001 | 0 | 0 | 0.092 |
| Pct Control | 62.5 | 38.2 | 19.2 | 174 | 105 |
| Tox Sig Effect Code | NSL | SL | SL | SG | NSG |
| **9/17/2002** | | | | | |
| Mean | 100 | 22 | 743000 | 0.285 0.229 | 55 48 |
| Std Dev | 0 | 4 | 210000 | 0.098 0.096 | 27.7 26.6 |
| Probability | 0.5 | 0.012 | 0 | 0.439 0.273 | 0.032 0.009 |
| Pct Control | 100 | 137 | 11.3 | 102 111 | 70 61.4 |
| Tox Sig Effect Code | NSG | SG | SL | NSG NSG | SL SL |



TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

### 3.4.8 San Marcos Creek

**Station No. 904CBSAM3** is located in HA 904.52 on the downstream side of Discovery Street bridge in the City of San Marcos, just upstream of Lake San Marcos. (GPS 33.13027N 117.19200W)

Water Chemistry (Table 3-14.1)

Two of the four samples exceeded the water quality objectives for total nitrogen, but the average and median values were below the objective. All samples exceeded the total phosphorus objective and three of four samples exceeded the sulfate objective. This location had the second highest average concentration of selenium at 16.69 ug/L with a peak concentration of 39.7 ug/L occurring on March 12, 2002.

This location had the second highest total of detections of pesticides/herbicides in the Carlsbad HU. Carbophenothion, demeton-s, dicrotophos, mevinphos, and naled (Dibrom) were detected in the March 12 sample and parathion (methyl) and dacthal in the April 23 sample between the MDL and RL. Diazinon was detected in three samples at levels exceeding the CDFG chronic criterion of 0.05 ug/L, with two of the samples exceeding the acute criterion of 0.08 ug/L. Disulfoton exceeded the RL in two of the samples. DDD(o,p') was detected in one sample and DDE(p,p') in three samples. DDT(p,p') and Endrin were detected in the April sample between the MDL and RL. oxadiazon, atrazine, secbumeton, terbuthylazine were persistently exceeded. Oxadiazon exceeded the RL in three of the four samples. Atrazine detected above the RL in one sample and between the MDL and RL in another. Propazine was detected in the June sample between the MDL and RL. Secbumeton and terbuthylazine were detected in three samples above the RL.



Toxicity: (Table 3-14.2)

Water and sediment samples showed a persistence of toxicity. The results for two of the four water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on selenastrum with the April sample also SL for ceriodaphnia (survival). Three of four samples of sediment was SL for Hyalella (survival).

Table 3-14.1 Monitoring Results Station CBSAM3 – San Marcos Creek

| STATION 904CBSAM3 | | Threshold | | SampleDate | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 3/12/02 | | | 4/23/02 | | 6/4/02 | | 9/18/02 | |
| Analyte | Units | Value | Source | Values | Values | Notes | Values | Notes | Values | Notes | Values | Notes |
| **General/Physical** | | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 8.2 | | | 8.1 | | 8.07 | | 7.43 | |
| Specif. Conduct. | mS/cm | | | 1.905 | | | 2.284 | | 1.969 | | 2.717 | |
| Temp. | $^0$C | | | 18.05 | | | 16.5 | | 20.02 | | 18.74 | |
| Turbidity | ntu | 20 | BP | 3.7 | | | 1.7 | | 4.9 | | 8.72 | |
| Velocity | fps | | | 1.44 | | | 0.495 | | 0 | | 0.5 | |
| Sat.Oxygen | % | | | 98 | | | 92.7 | | 96.3 | | 94.6 | |
| **Inorganics** | | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 219 | | | 241 | | 282 | | 241 | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.07 | | a | 0.27 | | 0.07 | a | 0.081 | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 0.176 | | | 0.227 | | 0.944 | | 0.658 | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.37 | | a | 0.37 | a | 0.37 | a | 0.6 | |
| OrthoPhosphate as P | mg/L | | | 0.175 | | | 0.096 | | 0.092 | | 0.194 | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.15 | | | 0.12 | | 0.12 | | 0.38 | |
| Sulfate | mg/L | 250 | BP | 221 | | | 293 | | 362 | | 373 | |
| **Dissolved Metals** | | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 1.3 | 1.4 | d | 2.14 | | 1.34 | | 14.9 | |
| Arsenic | µg/L | 50 | MCL | 12.5 | 12.4 | d | 2.98 | | 13.1 | | 3.48 | |
| Cadmium | µg/L | 4.1/11 | CTR | 0.22 | 0.263 | d | 0.0586 | | 0.271 | | 0.0829 | |
| Chromium | µg/L | 50 | MCL | 1.85 | 1.88 | d | 0.437 | | 1.25 | | 0.514 | |
| Copper | µg/L | 18/29 | CTR | 3.34 | 3.52 | d | 3.33 | | 3.41 | | 2.99 | |
| Lead | µg/L | 6.2/160 | CTR | -0.01 | -0.01 | b,d | 0.0204 | | 2.41 | | 0.0583 | |
| Manganese | µg/L | 50 | MCL | 504 | 513 | d | 79.1 | | 140 | | 82.7 | |
| Nickel | µg/L | 110/950 | CTR | 1.91 | 1.56 | d | 1.33 | | 3.65 | | 2.87 | |
| Selenium | µg/L | 20 | CTR | 38.9 | 39.7 | d | 5.56 | | 13.6 | | 8.31 | |
| Silver | µg/L | 14/17 | CTR | -0.01 | 0.01 | b,d | -0.01 | b | 0.233 | | -0.008 | b |
| Zinc | µg/L | 240/240 | CTR | 6.01 | 6.3 | d | 14.7 | | 3.78 | | 6.75 | |
| **OP Pesticides** | | | | | | | | | | | | |
| Carbophenothion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | | a | -0.03 | b | -0.03 | b | -0.03 | b |
| Demeton-s | µg/L | 0.04/0.05 | MDL / RL | 0.04 | | a | -0.04 | b | -0.04 | b | -0.04 | b |
| Diazinon | µg/L | 0.02/0.05 | MDL / RL | -0.005 | | b | 0.375 | | 0.25 | b | 0.062 | b |
| Dicrotophos | µg/L | 0.03/0.05 | MDL / RL | 0.04 | | a | -0.03 | b | -0.03 | b | -0.03 | b |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | -0.01 | | b | 0.125 | | 0.05 | | -0.01 | b |
| Mevinphos | µg/L | 0.03/0.05 | MDL / RL | 0.04 | | a | -0.03 | b | -0.03 | b | -0.03 | b |
| Naled(Dibrom) | µg/L | 0.03/0.05 | MDL / RL | 0.04 | | a | -0.03 | b | -0.03 | b | -0.03 | b |
| Parathion, Methyl | µg/L | 0.01/0.05 | MDL / RL | -0.01 | | b | 0.03 | a | -0.01 | b | -0.01 | b |
| **OC Pesticides** | | | | | | | | | | | | |
| Dacthal | µg/L | 0.001/0.002 | MDL / RL | -0.001 | | b | 0.001 | a | -0.001 | b | -0.001 | b |
| DDD(o,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | | b | -0.001 | b | 0.002 | | -0.001 | b |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | | b | 0.006 | | 0.002 | | 0.003 | |
| DDT(p,p') | µg/L | 0.002/0.005 | MDL / RL | -0.002 | | b | 0.003 | a | -0.002 | b | -0.002 | b |
| Endrin | µg/L | 0.001/0.002 | MDL / RL | -0.001 | | b | 0.001 | a | -0.001 | b | -0.001 | b |
| Endrin Aldehyde | µg/L | 0.002/0.005 | MDL / RL | -0.002 | | b | 0.008 | | -0.002 | b | -0.002 | b |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | 0.112 | | | 0.063 | | 0.025 | | -0.001 | b |
| **Trianzine Herbicides** | | | | | | | | | | | | |
| Atrazine | µg/L | 0.02/0.05 | MDL / RL | 0.13 | | | 0.035 | a | -0.02 | b | -0.02 | b |
| Propazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | b | -0.02 | b | 0.035 | a | -0.02 | b |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | 0.34 | | | 0.262 | | 0.75 | | -0.02 | b |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | 0.5 | | | 2.5 | | 0.422 | | -0.02 | b |
| **PCBs** | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | | |



Abbreviations: MDL - method detection level
RL - reporting level

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. Holding time violation occurred, flagged by QAO
d. First sample is a blind duplicate. Data averaged together before used in calculations

Table 3-13.2 Toxicity Results Station CBSAM3 – San Marcos Creek

| Station CBSAM3 | Toxicity Species | | | | |
|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | |
| Sample Type: | grab | | grab | integrated | |
| Matrix: | water | | water | sediment | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | |
| Eval Threshold | 80% | | 80% | 80% | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | 10 days |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | Survival (%) |
| Unit | % | Num/Rep | cells/ml | mg/ind | % |
| Rep Count | 10 | 10 | 4 | 8 | 8 |
| **3/12/2002** | | | | | |
| Mean | 100 | 28 | [illegible] | 0.108 | 13 |
| Std Dev | 0 | 5 | [illegible]07 | 0.044 | 15.8 |
| Probability | 0.172 | [illegible] | [illegible] | 0.277 | 0 |
| Pct Control | 111.1 | 21 | 61.9 | 118 | 14.3 |
| Tox Sig Effect Code | NSG | [illegible] | SL | NSG | SL |
| **4/23/2002** | | | | | |
| Mean | 0 | (1) | 3438000 | 0.367 | 15 |
| Std Dev | 0 | | 452106 | 0.251 | 13.1 |
| Probability | 0 | | 0.004 | 0.089 | 0 |
| Pct Control | 0 | | 67.1 | 158 | 16 |
| Tox Sig Effect Code | SL | NA | SL | NSG | SL |
| **6/4/2002** | | | | | |
| Mean | 90 | 27 | 5048000 | 0.144 | 75 |
| Std Dev | 31.6 | 12 | 854010 | 0.064 | 27.8 |
| Probability | 0.278 | 0.072 | 0.377 | 0.489 | 0.053 |
| Pct Control | 112.5 | 138 | 103 | 99.5 | 80 |
| Tox Sig Effect Code | NSG | NSG | NSG | NSG | NSG |
| **9/17/2002** | | | | | |
| Mean | 100 | 19 | 7458000 | 0.32 0.208 | 50 54 |
| Std Dev | 0 | 6 | 1024695 | 0.105 0.044 | 27.4 26.7 |
| Probability | 0.172 | 0.121 | 0.481 | 0.169 0.495 | 0.014 0.025 |
| Pct Control | 111.1 | 84.9 | 100 | 115 100 | 63.6 69.5 |
| Tox Sig Effect Code | NSG | NSG | NSG | NSG NSG | SL SL |



Notes: (1) No surviving adults

TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

**Station No. 904CBSAM6** is located in HA 904.51 at the El Camino Real crossing downstream of La Costa Resort & Spa, in the City of Carlsbad. (GPS 33.08791N 117.26852W) This station had the three lowest levels of saturated oxygen of all the stations in the Carlsbad HU, averaging approximately 50% for those three samples. The stream velocity was consistently less than measurable. Turbidity measured at 22 NTU and specific conductance at 28.58 on September 17th was the highest recorded of all sampling events. This station also recorded the highest temperature readings.

Water Chemistry (Table 3-15.1)

Only one sample slightly exceeded the total nitrogen water quality objective, whereas all four samples exceeded the total phosphorus and sulfate objectives. This location had the highest average concentration of selenium at 20.4 ug/L, with a peak concentration of 57.2 ug/L occurring on September 17, 2002.



Diazinon was detected above the MDL in all four samples, with one between the MDL and RL, and one above CDFG chronic criterion of 0.05 ug/L. Dioxathion was detected in the March sample between the MDL and RL, disulfoton in the March and April samples between the MDL and RL and the June sample above the RL. DDE(p,p'), endosulfan II, endrin aldehyde, HCH, alpha, methoxychlor, and propazine were all detected in single samples. Oxadiazon was detected at quantifiable levels in three samples, atrazine in two samples but at less than quantifiable levels, secbumeton and terbuthylazine in two samples at quantifiable levels and one at less than quantifiable.

Toxicity (Table 3-15.2)

Water and sediment samples showed a persistence of toxicity. All four water samples were significant compared to negative control based on statistical test, alpha of less than 5%, and less than the evaluation threshold (Code SL) in testing on selenastrum. Two of the four samples were also SL for ceriodaphnia (young/female) with the September sample also SL for ceriodaphnia (survival). Three of four samples of sediment was SL for Hyalella (survival).

Table 3-15.1 Monitoring Results Station CBSAM6 – San Marcos Creek

| STATION 904CBSAM8 | | | | SampleDate | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Threshold | | 3/13/02 | | 4/23/02 | | 6/4/02 | | 9/17/02 | |
| Analyte | Units | Value | Source | Values | Notes | Values | Notes | Values | Notes | Values | Notes |
| **General/Physical** | | | | | | | | | | | |
| pH | units | 6.5 - 8.5 | BP | 7.72 | | 7.89 | | 7.65 | | 7.56 | |
| Specif. Conduct. | mS/cm | | | 6.506 | | 6.047 | | 5.146 | | 28.58 | |
| Temp. | $^0$C | | | 17.19 | | 25.06 | | 19.08 | | 23.4 | |
| Turbidity | ntu | 20 | BP | 5.3 | | 3.5 | | 6.97 | | 22 | |
| Velocity | fps | | | 0 | | 0 | | 0 | | 0 | |
| Sat.Oxygen | % | | | 53.9 | | 134.3 | | 56.1 | | 40.8 | |
| **Inorganics** | | | | | | | | | | | |
| Alkalinity as CaCO3 | mg/L | 20000 | EPA | 220 | | 234 | | 241 | | 205 | |
| Ammonia as N | mg/L | 7.97 | EPA | 0.13 | | 0.24 | | 0.07 | a | 0.11 | |
| Nitrate + Nitrite as N | mg/L | 1 | BP | 0.274 | | 0.245 | | 0.333 | | 0.239 | |
| Nitrogen, Total Kjeldahl | mg/L | 1 | BP | 0.68 | | 0.58 | | 0.79 | | 0.69 | |
| OrthoPhosphate as P | mg/L | | | 0.186 | | 0.19 | | 0.221 | | 0.207 | |
| Phosphorus, Total as P | mg/L | 0.1 | BP | 0.27 | | 0.23 | | 0.28 | | 0.26 | |
| Sulfate | mg/L | 250 | BP | 577 | | 654 | | 832 | | 1700 | |
| **Dissolved Metals** | | | | | | | | | | | |
| Aluminum | µg/L | 1000/200 | MCL | 54 | | 2.14 | | 24.3 | | -0.1 | |
| Arsenic | µg/L | 50 | MCL | 2.77 | | 5.91 | | 2.29 | | 14 | |
| Cadmium | µg/L | 4.1/11 | CTR | 0.16 | | -0.01 | | 0.163 | | 0.057 | |
| Chromium | µg/L | 50 | MCL | 1.95 | | 0.44 | | 1.89 | | 1.58 | |
| Copper | µg/L | 18/29 | CTR | 4.03 | | 3.14 | | 4.25 | | 8.92 | |
| Lead | µg/L | 6.2/160 | CTR | 0.497 | | -0.01 | | 0.279 | | 0.0112 | |
| Manganese | µg/L | 50 | MCL | 46.7 | | 496 | | 30.2 | | 594 | |
| Nickel | µg/L | 110/950 | CTR | 1.37 | | 2.55 | | 2.12 | | 1.97 | |
| Selenium | µg/L | 20 | CTR | 4.89 | | 15.8 | | 3.7 | | 57.2 | |
| Silver | µg/L | 14/17 | CTR | -0.01 | b | -0.01 | b | 0.049 | | 0.022 | |
| Zinc | µg/L | 240/240 | CTR | 27.9 | | 3.69 | | 15.9 | | 7.16 | |
| **OP Pesticides** | | | | | | | | | | | |
| Diazinon | µg/L | 0.02/0.05 | MDL / RL | 0.054 | | 0.037 | | 0.037 | | 0.013 | a |
| Dioxathion | µg/L | 0.03/0.05 | MDL / RL | 0.04 | a | -0.03 | b | -0.03 | b | -0.03 | b |
| Disulfoton | µg/L | 0.01/0.05 | MDL / RL | 0.03 | a | 0.03 | a | 0.073 | | -0.01 | b |
| **OC Pesticides** | | | | | | | | | | | |
| DDE(p,p') | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | 0.002 | | -0.001 | b | -0.001 | b |
| Endosulfan II | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.0064 | |
| Endrin Aldehyde | µg/L | 0.002/0.005 | MDL / RL | -0.002 | b | 0.003 | a | -0.002 | b | -0.002 | b |
| HCH, alpha | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | -0.001 | b | 0.005 | |
| Methoxychlor | µg/L | 0.001/0.002 | MDL / RL | -0.001 | b | -0.001 | b | 0.001 | a | -0.001 | b |
| Oxadiazon | µg/L | 0.001/0.002 | MDL / RL | 0.017 | | 0.015 | | 0.007 | | -0.001 | b |
| **Trianzine Herbicides** | | | | | | | | | | | |
| Atrazine | µg/L | 0.02/0.05 | MDL / RL | 0.035 | a | 0.035 | a | -0.02 | b | -0.02 | b |
| Propazine | µg/L | 0.02/0.05 | MDL / RL | -0.02 | b | -0.02 | b | 0.035 | a | -0.02 | b |
| Secbumeton | µg/L | 0.02/0.05 | MDL / RL | 0.035 | a | 0.18 | | 0.251 | | -0.02 | b |
| Terbuthylazine | µg/L | 0.02/0.05 | MDL / RL | 0.035 | a | 0.875 | | 0.55 | | -0.02 | b |
| **PCBs** | | | | | | | | | | | |
| none exceeding MDL or RL | | | | | | | | | | | |
| **PAHs** | | | | | | | | | | | |
| Acenaphthene | µg/L | 0.02/0.05 | MDL / RL | 0.035 | a | -0.02 | b | -0.02 | b | -0.0125 | b,c |
| Anthracene | µg/L | 0.02/0.05 | MDL / RL | 0.08 | | -0.02 | b | -0.02 | b | -0.0125 | b,c |
| Fluorene | µg/L | 0.02/0.05 | MDL / RL | 0.025 | | -0.02 | b | -0.02 | b | -0.0125 | b,c |
| Naphthalene | µg/L | 0.02/0.05 | MDL / RL | 0.035 | a | 0.035 | a | -0.02 | b | -0.0125 | b,c |
| Phenanthrene | µg/L | 0.02/0.05 | MDL / RL | 0.08 | | -0.02 | b | -0.02 | b | -0.0125 | b,c |



Abbreviations: MDL - method detection level
RL - reporting level
µg/L - micrograms per liter

Notes: a. Calculated value 1/2 distance between MDL and RL
b. Less than MDL
c. A holding time violation has occurred; Surrogate Corrected value; Analyte was not detected above the reported sample quantitation limit
d. First sample is a blind duplicate. Data averaged together before used in calculations
e. Laboratory Contamination

Table 3-13.2 Toxicity Results Station CBSAM6 – San Marcos Creek

| Station CBSAM6 | Toxicity Species | | | | |
|---|---|---|---|---|---|
| | Ceriodaphnia dubia | | Selenastrum capricornutum | Hyalella azteca | |
| Sample Type: | grab | | grab | integrated | |
| Matrix: | water | | water | sediment | |
| Method | EPA 1994 (EPA 600/4-91/002) | | EPA 1994 (EPA 600/4-91/002) | EPA 2000 (EPA 600R-99/064) | |
| Eval Threshold | 80% | | 80% | 80% | |
| Stat Method | Paired T-test | | Paired T-test | Paired T-test | |
| Toxic Test Dur | 7 days | 7 days | 4 days | 10 days | 10 days |
| Toxic End Point | Survival (%) | Young/ female (#) | Total Cell Count | Growth (weight) | Survival (%) |
| Unit | % | Num/Rep | cells/ml | mg/ind | % |
| Rep Count | 10 | 10 | 4 | 8 | 8 |
| **3/12/2002** | | | | | |
| Mean | (1) | (1) | 2468000 | 0.287 | 76 |
| Std Dev | | | 232666 | 0.056 | 17.7 |
| Probability | | | 0 | 0 | 0.074 |
| Pct Control | | | 0. | 312 | 87.1 |
| Tox Sig Effect Code | NA | NA | SL | SG | NSG |
| **4/23/2002** | | | | | |
| Mean | 100 | 7 | 1768000 | 0.258 | 21 |
| Std Dev | 0 | 3 | 291662 | 0.181 | 15.5 |
| Probability | 0.5 | 0 | 0 | 0.352 | 0 |
| Pct Control | 100 | 31.4 | 34.5 | 111 | 22.7 |
| Tox Sig Effect Code | NSG | SL | SL | NSG | SL |
| **6/4/2002** | | | | | |
| Mean | 90 | 3 | 1568000 | 0.123 | 26 |
| Std Dev | 31.6 | 2 | 241661 | 0.06 | 16 |
| Probability | 0.278 | 0 | 0 | 0.184 | 0 |
| Pct Control | 112.5 | 14 | 32 | 85.3 | 28 |
| Tox Sig Effect Code | NSG | SL | SL | NSG | SL |
| **9/17/2002** | | | | | |
| Mean | 0 | (2) | 2148000 | 0.27 0.1 | 29 4 |
| Std Dev | 0 | | 1287996 | 0.119 0.141 | 25.3 5.18 |
| Probability | 0 | | 0.001 | 0.429 0.035 | 0 0 |
| Pct Control | 0 | | 32.8 | 96.8 48.2 | 36.6 4.85 |
| Tox Sig Effect Code | SL | NA | SL | NSG SL | SL SL |



NOTES: (1) Sample was never tested because it was salty, so it was tested with Strongylocentrotus purpuratus (urchins), with results showing a mean percent normal pluteus stage of 99%, a std dev of 1.3, a probability of 0.058, a pct control of 105, and a tox sig effect code of NSG. (2) No surviving adults

TOXIC SIG EFFECT CODES

**SL** - Significant compared to negative control based on statistical test, alpha of less than 5%, AND less than the evaluation threshold (Both criteria met)

**NG** - Significant compared to negative control based on statistical test, alpha less than 5%, BUT is greater than the evaluation threshold (Only the first criteria met)

**NSL** - Not significant compared to negative control based on statistical test, alpha less than 5%, but was less than the evaluation threshold (Second criteria met)

**NSG** - Not significant compared to negative control based on statistical test, alpha of 5%, and is above the evaluation threshold (No criteria met)

## 4.0 OTHER MONITORING

### 4.1 MUNICIPAL STORM WATER PERMIT FOR THE SAN DIEGO COUNTY

As discussed in Section 2.4, the San Diego MS4 Permittees conduct water quality monitoring within the Carlsbad HU. The following is a summary of the Fiscal Year 2003-2004 results.

*MS4 Mass Loading Monitoring Program Results*

There are two monitoring stations, one on Agua Hedionda Creek under the El Camino Real crossing near SWAMP station 904CBAQH6, and the other on Escondido Creek, east of Rancho Santa Fe Road, under the El Camino Del Norte Bridge upstream of SWAMP station 904CBESC8. Where appropriate, and when additional SWAMP resources are available, quantitative water quality data from copermittee monitoring will be integrated with the SWAMP data to allow for a more comprehensive assessment of water quality within the Carlsbad HU. The *San Diego County Municipal Copermittees 2003-2004 Urban Runoff Monitoring Final Report* (MEC; January 2005) states the following regarding the mass loading monitoring program.



Agua Hedionda

Three storms were monitored in the 2003-2004 season, one each in November, January, and February. The results are included with previous measurements dating back to 1998 in Table 6-3. Common previous exceedances in fecal coliform, total dissolved solids, total suspended solids, turbidity, and diazinon continued to appear during this monitoring season. However, diazinon exceeded the water quality objective only once this season compared to six out of six exceedances over the previous two seasons. Constituent exceedances new to this watershed included biological oxygen demand (1 exceedance), chemical oxygen demand (2), and total phosphorus (1). No metals exceeded the water quality objectives.

The February 19th, 2004 sample from Agua Hedionda Creek showed toxicity to *Hyalella*. The NOEC for 96-hour survival was 50% of the test sample with a TUa of 0.69. No toxicity was expressed in the other two storm events from Agua Hedionda Creek to *Hyalella*. No toxicity to *Ceriodaphnia* or *Selenastrum* was observed in any of the Agua Hedionda Creek samples collected.

Escondido Creek

Three storms were monitored in the 2003-2004 season, one each in November, February, and March. The results are included with previous measurements dating back to 1998 in Table 6-4. Common previous exceedances in fecal coliform, total dissolved solids, turbidity, continued to appear during this monitoring season. The February storm brought constituent exceedances new to this watershed that included biological oxygen demand (1) and chemical oxygen demand (1). Nutrients appear to have the highest concentrations during the February storm. No metals exceeded the water quality objectives.

Samples from Escondido Creek did not cause toxicity to any of the three test species for all of the storm events monitored during 2003-04.

*MS4 Ambient Bay and Lagoon Monitoring Program Results*

Buena Vista Lagoon, Agua Hedionda Lagoon, Batisquitos Lagoon, and San Elijo Lagoon were monitored as part of the ABLM Program in 2003. The following is a summary of the data as presented in the MEC report.

Buena Vista Lagoon

Sediments in Buena Vista Lagoon were monitored as part of the 2003 ABLM Program to assess the potential for adverse effects from the watershed and to compare sediment quality with other coastal embayments in San Diego County. In Phase I, a stratified random approach was used to identify the three sites where COCs were most likely to be found (i.e., those with the highest TOC and smallest grain size): Site 1R-1 in the outer stratum, 2R-1 in the middle stratum, and 3R-1 in the inner stratum. These sites were sampled in Phase II of the assessment and analyzed for sediment chemistry, toxicity, and benthic community structure. The results of the chemistry assessment indicated that six of the nine metals analyzed were found in the Lagoon sediments. Concentrations were slightly higher than those found in other embayments, but were low compared to ERL and ERM values. Concentrations of all the metals were below their respective ERLs except copper, which was slightly higher than the ERL, but did not exceed the ERM. The mean ERM-Q for Buena Vista Lagoon was the third highest among the embayments assessed in the ABLM Program. The percent survival of test organisms exposed to the Lagoon sediments was significantly less than that of a Control, which suggests the presence of toxic agents. However, the low concentrations of the constituents monitored suggests that they did not account for the elevated toxicity. Only three taxa were found in Buena Vista Lagoon, all of which were freshwater animals. The low relative rankings are likely due to the influence of fresh water and lack of tidal flushing in the Lagoon rather than a greater than average contaminant loading. The relative ranks were developed from data collected in the summer of 2003 and presented for the first time in the 2004 report. However, attributing contaminants in the embayments directly to COCs in the watershed is premature at this time, particularly since samples for sediment chemistry and toxicity were based on a single composite for each embayment. Monitoring conducted in the future may help determine potential contaminant sources through the use of a longer-term data set.



Agua Hedionda Lagoon

Sediments in Agua Hedionda Lagoon were monitored as part of the 2003 ABLM Program to assess the potential for adverse effects from the watershed and to compare sediment quality with other coastal embayments in San Diego County. In Phase I, a stratified random approach was used to identify the three sites where COCs were most likely to be found (i.e., those with the highest TOC and smallest grains size): Site 2M-1 in the middle stratum, and 3M-1 and 3L-1 in the inner stratum. These sites were sampled in Phase II of the assessment

and analyzed for sediment chemistry, toxicity, and benthic community structure. The results of the chemistry assessment indicated that six metals found in all the embayments assessed were also found in Agua Hedionda Lagoon at concentrations above the detection limit. Concentrations were slightly higher than those found in other embayments, but only arsenic and copper exceeded their respective ERLs. The mean ERM-Q for Agua Hedionda Lagoon exceeded the threshold value of 0.10 but concentrations of all metals were low, at least three times less than their respective ERMs. Toxicity associated with the sediments was significantly different from that of the Control, suggesting that toxic constituents were present in the Lagoon. Benthic community indices suggested that the biotic community in the Lagoon sediments was fair compared to other embayments in San Diego County. The infaunal community was dominated by the sea slug *Acteocina inculta,* which accounted for 55.5% of the taxa collected, horseshoe worms, and polychaete worms. The relative ranks for Agua Hedionda Lagoon compared to the other embayments in the ABLM Program were 5 for chemistry, 4 for toxicity, and 9 for benthic community structure. The relative ranks were developed from data collected in the summer of 2003 and presented for the first time in the 2004 report. However, attributing contaminants in the embayments directly to COCs in the watershed is remature at this time, particularly since samples for sediment chemistry and toxicity were based on a single composite for each embayment. Monitoring conducted in the future may help determine potential contaminant sources through the use of a longer-term data set.



Batiquitos Lagoon

Sediments in Batiquitos Lagoon were monitored as part of the 2003 ABLM Program to assess the potential for adverse effects from the watershed and to compare sediment quality with other coastal embayments in San Diego County. In Phase I, a stratified random approach was used to identify the three sites where COCs were most likely to be found (i.e., those with the highest TOC and smallest grains size). All three sites (3L-2, 3M-5, and 3R-2) were located in the inner stratum of the Lagoon. These sites were sampled in Phase II of the assessment and analyzed for sediment chemistry, toxicity, and benthic community structure. The results of the chemistry assessment indicated that six metals common to all of the embayments assessed were also found in Batiquitos Lagoon. Concentrations were low compared to published values, but arsenic and copper exceeded their respective ERLs. The mean ERMQ for Batiquitos Lagoon, based on these constituents was 0.152, which was intermediate among the other coastal embayments assessed. This value exceeded the threshold of 0.10, which may indicate an increased probability of producing adverse biological effects. However, concentrations of all metals were low four to 12 times less than their respective ERMs. The percent survival of test organisms exposed to sediments from Batiquitos Lagoon was significantly less than that of the control, suggesting the presence of toxic elements in the Lagoon. However, analyses of benthic community indices suggested that the biotic community in Batiquitos Lagoon was good compared to the other embayments. Three taxa dominated the infaunal community in Batiquitos Lagoon: the barley snail *Barleeia sp*, the herbivorous amphipod *Ampithoe longimana*, and the sea slug *Acteocina inculta*. For Batiquitos Lagoon, the relative ranks were 6 for chemistry, 2 for toxicity, and 10 for benthic community structure. The relative ranks were developed from data collected in the summer of 2003 and presented for the first time in the 2004 report. However, attributing

contaminants in the embayments directly to COCs in the watershed is premature at this time, particularly since samples for sediment chemistry and toxicity were based on a single composite for each embayment. Monitoring conducted in the future may help determine potential contaminant sources through the use of a longer-term data set.

San Elijo Lagoon

Sediments in San Elijo Lagoon were monitored as part of the 2003 ABLM Program to assess the potential for adverse effects from the watershed and to compare sediment quality with other coastal embayments in San Diego County. In Phase I, a stratified random approach was used to identify the three sites where COCs were most likely to be found (i.e., those with the highest TOC and smallest grains size): Site 2M-1 in the middle stratum, and 3L-4 and 3R-4 in the inner stratum. These sites were sampled in Phase II of the assessment and analyzed for sediment chemistry, toxicity, and benthic community structure. The results of the chemistry assessment indicated that all of the nine metals assessed were found in the Lagoon sediments, but none exceeded its respective ERL value. The mean ERM-Q for San Elijo Lagoon was 0.116, which exceeded the published threshold value of 0.10 and suggests the potential for increased toxicity. Percent survival of test organisms exposed to San Elijo Lagoon sediments was significantly different from that of the control, suggesting the presence of toxic agents. Benthic community indices suggested that the biotic community in the Lagoon sediments ranked low compared to other embayments in San Diego County. This was primarily due to the lack of organisms found at Site 3R-4, which is located in the inner-most part of the Lagoon and receives minimal tidal flushing. The infaunal community was dominated by a genus of barley snail and polychaete worms. For San Elijo Lagoon, the relative ranks were 7 for chemistry, 3 for toxicity, and 4 for benthic community structure. The relative ranks were developed from data collected in the summer of 2003 and presented for the first time in the 2004 report. However, attributing contaminants in the embayments directly to COCs in the watershed is premature at this time, articularly since samples for sediment chemistry and toxicity were based on a single composite for each embayment.



*MS4 Rapid Stream Bioassessments Results*

The MEC report states that the Carlsbad WMA included four bioassessment monitoring sites, two on Agua Hedionda Creek and two on Escondido Creek. Index of Biotic Integrity scores rated the benthic communities Very Poor at all four sites. The Elfin Forest site in Escondido Creek, with excellent physical habitat conditions, was at the upper limit of the Very Poor range and an impairment sensitive caddisfly was collected there. This likely indicates some measure of water quality improvement occurred between Harmony Grove Bridge and Elfin Forest. The Agua Hedionda Creek sites both had marginal in-stream habitat conditions, which may have limited macroinvertebrate colonization.

## 4.2 RWQCB 1998-2001 AMBIENT BIOASSESSMENT MONITORING PROGRAM

Benthic community data collected at 14 sites in the Carlsbad Watershed in the course of the RWQCB Ambient Bioassessment Monitoring Program between 1998 and 2001 provided preliminary indications of significant impact to the benthic macroinvertebrate communities in

Loma Alta Creek, Buena Vista Creek, San Marcos Creek, Escondido Creek, Agua Hedionda Creek, and Encinitas Creek. Almost all of the sites in the Carlsbad Watershed had well below average ranking scores. The Index of Biotic Integrity scores ranged from Very Poor (0-12; lowest score = 5) to Good (38-54, highest score =45) with the maximum possible score being 70. None of the stations sampled in the Carlsbad watershed represented reference conditions or approached Very Good.

TABLE 4-1
Benthic macroinvertebrate sampling site information for sampling events between May 1998 and May 2001 in the Carlsbad HU with San Diego IBI Score

| LOCATION DESCRIPTION | SITE ID | LATITUDE/ LONGITUDE | Site No. | May 1998 | Sept 1998 | Nov 1998 | May 1999 | Nov 1999 | May 2000 | Nov 2000 | May 2001 | San Diego IBI Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Loma Alta Creek: Reach consisted of 5 riffles downstream of College Blvd. | LAC-CB | N33° 12' 18.0" W117° 17' 13.4" | 38 | x | x | x | x | x | - | - | - | Poor to Fair |
| Loma Alta Creek: Reach consisted of 5 riffles downstream of El Camino Real | LAC-ECR | N33° 11' 57.6" W117° 19' 48.2" | 39 | x | x | x | x | - | x | x | - | Poor |
| Buena Vista Creek: Reach consisted of 5 riffles downstream of Santa Fe Avenue | BVR-ED | N33° 11' 57.9" W117° 14' 35.1" | 40 | x | x | x | x | x | - | - | - | Fair |
| Buena Vista Creek: Reach consisted of 5 riffles upstream of South Vista Way | BVR-SVW | N33° 10' 48.7" W117° [illegible] | 41 | x | x | x | x | x | x | x | - | Very Poor to Poor |
| Agua Hedionda Creek: Reach consisted of 5 riffles downstream of Sycamore Avenue | AHC-SA | N33° 09' 22.5" W117° 13' 34.0" | 42 | x | x | - | - | - | - | - | - | |
| Agua Hedionda Creek: Reach consisted of 5 riffles downstream of El Camino Real | AHC-ECR | N33° 08' 57.0" W117° 17' 46.9" | 43 | x | x | x | x | x | x | x | x | Poor to Good |
| San Marcos Creek: Reach consisted of 5 riffles 50 m upstream of Mc Mahr Road intersection | SMC-M | N33° 07' 47.8" W117° 11' 29.0" | 44 | x | x | x | x | x | x | x | - | Poor to Fair |
| San Marcos Creek: Reach consisted of 5 riffles downstream of Santar Place | SMC-SP | N33° 08' 37.0" W117° 08' 54.2" | 45 | x | x | x | x | x | - | - | - | Poor |
| San Marcos Creek: Reach consisted of 5 riffles 50 m upstream of Mc Mahr Road intersection | SMC-RSFR | N33° 06' 12.9" W117° 13' 33.6" | 46 | x | x | x | x | x | - | x | - | Poor to Fair |
| San Marcos Creek: Reach consisted of 5 riffles downstream of Rancho Santa Fe Road | SMC-LCCC | N33° 05' 18.7" W117° 14' 43.6" | 47 | x | x | x | x | x | x | x | - | Fair |
| Encinitas Creek: Reach consisted of 5 riffles downstream of Green Valley Rd | ENC-GVR | N33° 04' 17.5" W117° 15' 43.8" | 48 | x | x | x | x | x | x | - | - | Poor |
| Encinitas Creek: Reach consisted of minimal riffle habitat, large pool was sampled using lentic procedures in May 2000 | ENC-RSFR | N33° 04′ 4.2″ W117° 14′ 42.1″ | 49 | - | - | - | - | - | x | - | - | |
| Escondido Creek: Reach consisted of 5 riffles downstream of Harmony Grove bridge | EC-HRB | N33° 06' 31.6" W117° 06' 41.2" | 51 | x | x | x | x | x | - | - | - | Poor |
| Escondido Creek: Reach consisted of 5 riffles downstream of Elfin Forest Resort | EC-EF | N33° 04' 17.6" W117° 09' 52.0" | 52 | x | x | x | x | x | x | - | - | Poor |
| Escondido Creek: Reach consisted of 5 riffles upstream of Elfin Forest on Harmony Grove Rd. | EC-HG | N33E04' 35.2″ W117E 09' 33.3″ | 53 | - | - | - | - | - | - | x | - | |
| Escondido Creek: Reach consisted of 5 riffles upstream of Rancho Santa Fe Road | EC-RSFR | N33° 02' 10.2" W117° 14' 6.1" | 54 | x | - | - | - | - | - | - | - | |

## 5. TRIAD APPROACH SUMMARY

The following conclusions have been made regarding the quality of the water at the sample locations using the triad approach described in above Section 3.3

Table 5-1 Data Assessment Summary

| **Station** | **Chemistry** *Persistent exceedance of water quality objectives?* | **Toxicity** *Evidence of toxicity?* | **Bioassessment** *Indications of benthic alteration?* | **Possible Conclusion Determining Action** | **Action** |
|---|---|---|---|---|---|
| 904CBAQH6 | yes | yes | yes | Strong evidence of pollution-induced degradation | Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |
| 904CBBUR1 | yes | no | no nearby sample | Contaminants are present but may not be bioavailable | Conduct bioassessment testing at a nearby location |
| 904CBBVR4 | yes | yes | yes | Strong evidence of pollution-induced degradation | Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |
| 904CBCWC2 | yes | yes | no nearby sample | Toxic contaminants are bioavailable, but in situ effects are not demonstrable | Conduct bioassessment testing at a nearby location |
| 904CBENC2 | yes | yes | yes | Strong evidence of pollution-induced degradation | Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |
| 904CBESC5 | yes | no | yes | Alteration may or may not be due to toxic pollutants | Initiate TRE for physical sources of benthic alteration |
| 904CBESC8 | yes | no | yes | | |
| 904CBLAC3 | yes | no | yes | | |
| 904CBSAM3 | yes | yes | yes | Strong evidence of pollution-induced degradation | Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |
| 904CBSAM6 | yes | yes | yes | Strong evidence of pollution-induced degradation | Conduct TIE to identify contaminants of concern, based on TIE metric, initiate TRE |

## 6. CONCLUSIONS AND RECOMMENDATIONS

1. The monitoring conducted in the Carlsbad HU during 2002 was an initial step in accomplishing the SWAMP objectives listed in Table 3-1 of this report. The SWAMP data, supplemented with the results of other monitoring referenced in this report presents an overview of surface water quality conditions in the Carlsbad HU at the start of the 21st century. The challenge at this time is to build upon this data and develop a coordinated program to focus future water quality assessment efforts and resources on the priority water quality issues in the watersheds.

2. The monitoring being conducted by the MS4 permittees should provide the foundation for this coordinated program. Currently, the MS4 permittees monitor stormwater flows at two mass loading stations three times per year and dry weather flows. The County of San Diego has requested that the frequency of monitoring at most mass loading stations be modified. Rather than monitoring most of the mass loading stations for three wet-weather events annually, the County of San Diego requested to monitor most of the mass loading stations for two wet-weather and two dry-weather events annually. The County suggests that the dry weather monitoring will characterize baseline conditions during dry weather flows, identify constituents in dry weather flows that are exceeding water quality objectives, and identify toxicity in dry weather flows. The monitoring results will also assist in identification and prioritization of water quality problems within and between watersheds, and can help focus upstream source investigations to identify and reduce pollutant sources. Additionally, data from dry weather mass loading monitoring can be compared to wet weather mass loading monitoring data in order to identify whether additional focus on dry weather flows is warranted.



3. Applying the triad approach to the test results, the recommended action for most stations in the watershed is to initiate a toxicity identification evaluation (TIE). One exception is Escondido Creek, which is consistent with the conclusions of the MS4 storm water monitoring reports that recommends a TIE for Agua Hedionda Creek, but not Escondido Creek.

4. Diazinon, disulfoton, oxadiazon, DDE (p,p'), secburnetron and terbuthylazine were widespread in the waters of the Carlsbad HU. The MS4 have continued testing for diazinon, which has decreased in 2003-04 from previous levels at the two mass loading stations. Further testing of surface water is necessary to access trends with the other organic constituents of concern.

5. Eutrophic conditions are identified on the 303(d) list for San Elijo Lagoon and Loma Alta Slough. Whereas Escondido Creek, which discharges to San Elijo Lagoon, had consistently elevated levels of total nitrogen and phosphorus levels, Loma Alta Creek,

which discharges to Loma Alto Slough, consistently had levels of total nitrogen and phosphorus below water quality objectives. Further studies are necessary to identify sources of nutrients to the Slough. In addition, studies should be conducted to access the impacts of elevated nutrient levels in Buena Creek, Cottonwood Creek, Encinitas Creek and San Marcos Creek.

6. An investigation should be conducted to determine if spikes of selenium are still occurring in San Marcos Creek and to determine the source if it is.

7. Sulfate exceeds the Basin Plan objectives throughout the HU. As the objective was based upon the secondary drinking water standard, an investigation should be conducted to determine if the elevated levels are causing or will cause any problems to current or future beneficial uses.

8. As with sulfate, manganese was persistently above a secondary MCL for drinking water and an investigation should be conducted to determine if the elevated levels are causing or will cause any problems to current or future beneficial uses.



9. Sediment toxicity to Hyalella azteca (survival) was recurrent in Buena Vista, San Marcos and Cottonwood creeks. Sediment toxicity affecting Hyalella azteca (growth) occurred more than once only at the Encinitas Creek location. An investigation to confirm the toxicity at these locations and determine its potential causes should be initiated.

10. Water samples were toxic to Selenastrum capricornutum at the Agua Hedionda, Loma Alta and San Marcos Creek downstream locations on all four occasions, with three and the four samples from Buena Vista and Cottonwood creeks being toxic. An investigation to confirm the toxicity at these locations and determine its potential causes should be initiated.

11. Few water samples (4 of 40 samples) met the Toxic Significant Effect criteria for Ceriodaphnia dubia (survival), but 16 of the 40 samples were found to be toxic (significant compared to negative control based on statistical test, and less than the evaluation threshold) in the Ceriodaphnia dubia (young/female) testing.